The Manuel Uribe Troncoso Issue

VOLUME 43 NUMBER 6 JUNE, 1957

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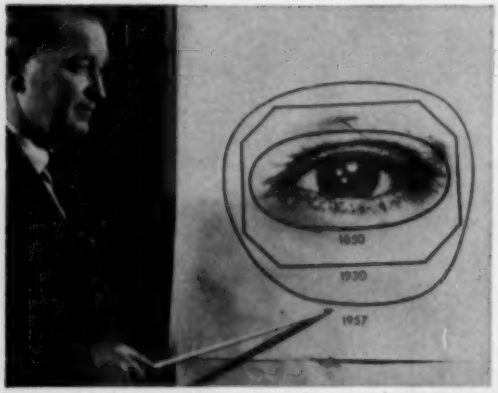

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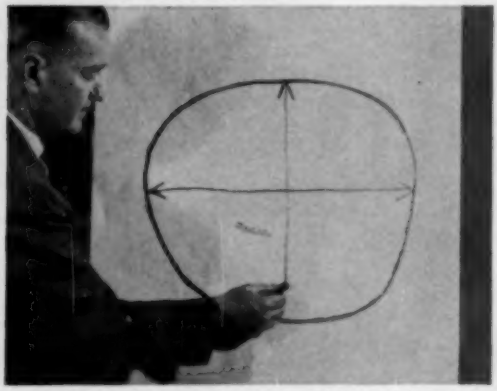

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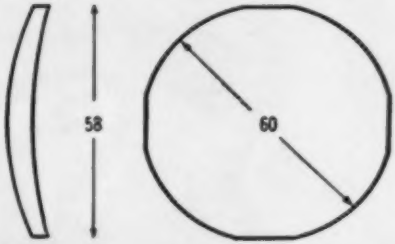

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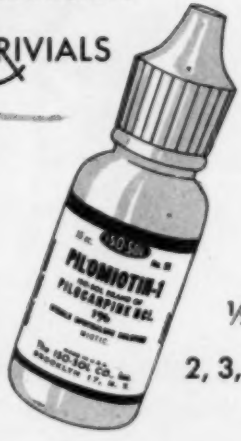

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AMERICAN JOURNAL OF OPHTHALMOLOGY

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THE MANUEL URIBA TRONCOSO ISSUE

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MANUEL URIBE TRONCOSO

The members of the editorial board of THE JOURNAL and innumerable friends join in felicitations and congratulations to Dr. Troncoso on his 90th birthday. The world is a better place because of him. Ophthalmologists and multitudes of their patients have benefited from his scientific contributions.

The present Series 3 of THE AMERICAN JOURNAL OF OPHTHALMOLOGY began in 1918 as a result of the amalgamation of six publications. One of these was the *Anales de Oftalmologie* founded by Dr. Troncoso in 1898 and edited by him. It had enjoyed wide recognition and success and brought prestige and good will to the new JOURNAL.

Of the chief editors of the six publications which joined forces, Dr. Troncoso is the only one still alive. His alert mind is ever seeking new approaches toward the solution of ophthalmic problems. We selfishly hope that he will have many more years to share his wisdom with us.

Derrick Vail.

MANUEL URIBE TRONCOSO

Manuel Uribe Troncoso, international authority on ophthalmology, was born on June 17, 1867, in the city of Toluca, capital of the state of Mexico, the son of Romualdo Uribe and Guadalupe Troncoso. He was one of 16 children. His preparatory schooling was in the Scientific and Literary Institute of the state of Mexico where he was a distinguished pupil.

Dr. Troncoso studied medicine at the University of Mexico, from which he received the degree of doctor of medicine on April 15, 1890. His thesis, an original research study entitled, "A study on herpetic keratitis," foreshadowed his career as a great oculist.

Two years after his graduation, Dr. Troncoso, as a member of the Section on Ophthalmology, assisted at the First Mexican Medical Congress held in Mexico City from December 6 to 10, 1892. In 1898 he founded the *Anales de Oftalmologie*. In 1899, he was named to the staff of the Ophthalmic Hospital which had been opened in Mexico City in 1898.

Having begun, as a simple scientific investigation, the examination of the eyes of school children, he wrote several papers on the subject which resulted in his being named Mexican delegate to the XIII International Conference on Hygiene and Public Health held in Berlin in September, 1907.

He remained in Europe until 1908, devoting his time to the study of ophthalmology and medical examinations in schools. On his return from Europe, he organized a department of student hygiene with a staff of 21 doctors and three nurses who assisted him in the medical examination of 35,000 pupils.

When Dr. Troncoso moved to New York in 1916, he received from the regents of the University of the State of New York the extraordinary distinction of being granted a license to practice medicine without examination because of his "conceded eminence and authority in his profession." From 1916 on, Dr. Troncoso dedicated himself completely to ophthalmology. He became professor of ophthalmology at the Post-Graduate Medical School and Hospital of New York City. In 1932 he gave up this post to accept an appointment to the Eye Institute of the College of Physicians and Surgeons, Columbia University, where he did research work in the Department of Research. During the years that followed he became assistant professor of ophthalmology at Presbyterian Hospital (Columbia University) where he served until his retirement.

In order to bring together the Spanish-speaking doctors in New York, to increase the ties of race and tongue, and to stimulate scientific research, Dr. Troncoso founded in New York, in 1916, a society of distinguished professional men, the Spanish-American Medical Society of New York.

Dr. Troncoso's contributions to ophthalmology have been many and distinguished. In 1945, he invented the gonioscope, and his second book, *A Treatise on Gonioscopy*, was published in 1947 and reprinted in 1948. The first such book in the world it marks Dr. Troncoso a pioneer in this method of eye examination. His first book *Internal Diseases of the Eye and Atlas of Ophthalmoscopy* was published in 1937; the second American edition appeared in 1950 and the Spanish translation was published in Mexico by Editorial Interamerica in 1952. In addition to these two monumental volumes, Dr. Troncoso has written more than 150 articles on medicine, ophthalmology, and school hygiene, papers which have been published in Spanish, French, German, and English.

In Mexico City on August 17, 1893, Dr. Troncoso was married to Miss Maria Alas, and to them were born seven children. Dr. Troncoso continues to live in New York.

During his long and active life Manuel Uribe Troncoso has contributed immeasurably to the welfare of mankind. THE JOURNAL salutes him on the occasion of his 90th birthday.

AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 43 JUNE, 1957 NUMBER 6

RADIOACTIVE ISOTOPES IN OPHTHALMOLOGY*

THE CHARLES H. MAY MEMORIAL LECTURE

EDWIN B. DUNPHY
Boston, Massachusetts

I never had the privilege of knowing Dr. May but I've always felt I owed him a great debt. My introduction to ophthalmology was through his remarkable little book, *Manual of the Diseases of the Eye*, and also through his electric ophthalmoscope, which was so fascinating to me as a medical student. It would be an exaggeration to say that these were the determining factors which influenced my decision to specialize in this field of medicine but they certainly had a lot to do with it. Therefore, I am particularly honored to be chosen to give the Charles H. May Memorial Lecture.

Although the use of radioactive isotopes in the field of general medicine is not new, their employment by clinical ophthalmologists has never been extensive. This is partly because of the difficulty of obtaining them until relatively recently, and partly because of a not too thorough understanding of the subject on our part. It is the purpose of this lecture to review briefly some of the historical and theoretical background, then to evaluate the role of these substances in our specialty, pointing out their usefulness and their limitations and, finally, to speculate on their potentialities in the field of therapy.

Because I believe this audience is composed chiefly of clinicians, like myself, I am going to review some of the elementary concepts of atomic energy, hoping that, if any nuclear physicist is present, he will be patient, since he will have a so much better understanding of this particular part of the subject than I.

A thorough basic knowledge of atomic energy can be obtained only by considerable study and work under the guidance of a nuclear physicist, something which most of us will never find the time to do, but there are certain fundamentals that every clinician must have at his fingertips if he wishes to understand the application of these principles to clinical work.

HISTORY

Actually, the atomic theory is an old one,[1] going back to the fifth century, B.C., when the Greek scholar, Democritus, taught that all matter was probably composed of small indivisible particles, which he called "atoma." These teachings found little general acceptance however and were not revived to any extent until after the Renaissance in Europe.

For many centuries orthodox scientific teaching had held that matter was composed of four elements: fire, earth, air, and water. But doubts began to be raised! Finally, after Lavoissier in 1774 proved that air was not an element but a mixture of gases, and Priestly in 1781 showed that water was made up of two gases, the old four element theory collapsed. Later on, Lavoissier demonstrated 20 separate elements and in 1819, Berzelius, the great Swedish physicist, increased the number to 50. At the present time, there are 103 known elements, each of which is made up of smaller units called atoms.

* Presented before the Section on Ophthalmology at The New York Academy of Medicine, March 19, 1956.

We now define the atom as the smallest possible or ultimate particle of an element. Thus, the cycle is complete and, after 2,500 years, we return to the original concept of the ancient Greeks!

Modern nuclear physics has now taught us that the atom itself has an internal structure which can be split into subatomic particles and, since this fact is responsible for the very existence of isotopes, a brief review of the subject seems desirable.

According to the Rutherford-Bohr model, the atom consists of a nucleus surrounded by a less dense outer shell. The nucleus, which composes 99.98 percent of the atom, is made up of protons, carrying a positive electric charge, and neutrons, which carry no charge. In the stable atom, the positive charges of the protons are balanced by the negative charges of the electrons, which swirl around the nucleus in various orbits of the outer shell.

The atomic number represents the total positive charge on the nucleus and, since each proton carries one positive charge, the atomic number is equivalent to the number of protons.

The mass number, which approximates the atomic weight, represents the sum total of the protons and neutrons in the nucleus. Subtracting the atomic number from the mass number gives us the number of neutrons.

Whereas the atomic number determines the chemical nature of the atom, the mass number identifies the structure of the nucleus. For example, when a neutron is added to the nucleus, it does not alter the charge but it does change the mass. Thus, there may be two or more substances each having the same atomic number but with different mass numbers and these are called "isotopes." For example, stable phosphorus is P^{31}. Its nucleus contains 15 protons and 16 neutrons. P^{32}, P^{29}, and P^{30} are isotopes of phosphorus. They all have the same number of protons and electrons, they behave essentially the same way chemically and biologically but, because of a disproportion in the normal neutron-proton ratio, their nuclei become unstable and disintegration takes place with release of energy and radiation.

Although naturally occurring radioactive substances, such as uranium and radium, had been discovered just before the turn of the century, it was not until 1934 that Irene Curie and Frederick Joliot found that various stable elements could be made artificially radioactive by bombarding them with certain particles, such as deuterons, neutrons, protons, alpha particles, and so forth. With this knowledge, a whole new field of medicine opened up in respect to the investigation of physiologic processes and the diagnosis and treatment of various conditions.

After a radioactive isotope has been created, either by the cyclotron or in the nuclear reactor, it will exhibit a characteristic behavior pattern which is very important for us to understand if we wish to use it intelligently.

The things we must know are the type of radiation emitted, the energy of the rays, and the physical and biologic half-life of the isotope itself. Also, we must be familiar with the proper dosage and the radiation hazards not only to the patient but to handling personnel.

Most isotopes emit either beta or gamma rays, or both; only a few emit alpha rays. Alpha rays, which are the nuclei of helium, have very weak penetrating power. Beta rays, which are high-speed electrons, are more penetrating. Gamma rays, which are part of the electromagnetic spectrum, are so penetrating that several centimeters of lead are necessary to block them. All these rays may give rise to ionization and photographic effects.

The energy of the radiation depends upon the velocity and the mass of the particle ejected from the unstable atom. This is closely related to the degree of penetrability and ionization in tissue and can vary greatly with the particular isotope employed. For example, the beta rays coming from radioactive sulfur can be stopped by less than a millimeter of tissue and, hence, are difficult

to detect in vivo. Beta rays arising from radioactive phosphorus (P^{32}) have a maximum range of seven to eight mm. and, thus, are very desirable for studying concentrations in the eyeball. Radioactive potassium (K^{42}), on the other hand, has penetrating beta rays of almost 20 mm., along with some gamma rays. Therefore, it is often useful for studying concentrations in deeper lesions of the body.

The half-life of any isotope is the time period in which half of its atoms will have disintegrated. This will vary from less than a second in some of the artificially produced ones to a million years in some of the naturally occurring ones.

From a practical standpoint, the half-life must be long enough to permit the completion of the test but not too long because of undesirable total body radiation if it is to be injected intravenously. Fortunately, most isotopes are excreted rather rapidly, so that their biologic half-lives are shorter than their physical half-lives.

For the detection of radioactivity some sort of ionization chamber or Geiger-Müller counter is utilized. The Geiger-Müller tube is the most widely used type, particularly for counting beta radiations.

Another type of detecting device is the scintillation counter, which makes use of the capacity of certain crystals to scintillate when stimulated by ionizing radiations. This method is usually used for the measurement of gamma radiations.

With this very brief summary of the theoretical considerations, let us now see what uses have been made of these radioactive substances in our own field of ophthalmology. These can be discussed under three general headings: (1) physiologic experiments; (2) diagnostic applications; (3) therapeutic possibilities.

Physiologic experiments

Many important experimental studies have been performed during the past 15 years in which tracers, particularly radioactive sodium (Na^{24}), have been used to gain knowledge of the circulation of the aqueous. Because sodium does not enter into cellular metabolism nor concentrate selectively in any tissue to the same degree as phosphorus, potassium, or iodine, it lends itself readily to studies of circulation times and fluid transfer. Its half-life of only 14.8 hours restricts its use to short-time experiments.

In 1942, Kinsey and associates,[2] in a series of papers, studied the rate of accumulation of sodium, chloride, and phosphorus in the anterior chamber of the rabbit by using the radioactive isotopes of these elements (Na^{24}, Cl^{38}, P^{32}).

They found that Na and Cl appeared to enter the anterior chamber at a rate equivalent to four c.mm./min. of whole aqueous in contrast to the 50 c.mm./min. reported previously for water by the same authors. In previous work,[3] using heavy water as a tracer, they had shown that water in the anterior chamber exchanges with that in the blood stream at a rate greatly in excess of the so-called rate of formation of aqueous. This led to the suggestion that the rate of formation of aqueous was more directly related to the movement of substances other than water, for example, electrolytes.

During the next four years, numerous other investigators, such as Visscher and Carr,[4] Scholz, Cowie, and Wilde,[5] Báràny and Kinsey,[6] Palm,[7] Duke-Elder, Davson, and Maurice[8] corroborated and elaborated on this pioneer work, using Na^{24} for the most part. As a result of all these investigations, it became possible to establish two important concepts which are generally accepted today and which completely changed our ideas on aqueous formation

1. A secretory mechanism exists in the ciliary body and ultrafiltration plays only a minor role in aqueous formation.
2. The nonelectrolytes enter the anterior chamber by diffusion, whereas most of the electrolytes enter by secretion.

Other important studies with isotopes may be mentioned briefly:

In 1949, von Sallmann, Evans, and Dillon[9] devised a method of obtaining topographic information of tracer atoms within the individual structures of the eye, using radiosodium (Na^{24}) and taking advantage of the photographic effect of the radiations emitted. By placing frozen slices of ocular tissues on radiosensitive emulsions, they demonstrated that the regions of the ciliary body and optic nerve were the main portals of entry for sodium into the eye from the blood.

In 1950, Potts and Johnson[10] used various tracer substances (Na^{24}, P^{32}, Cs^{134}, I^{131}) to evaluate the role played by the limbal circulation, the tears, and the aqueous in the nutritional supply of the rabbit cornea. The rates of their appearance in the cornea after both systemic and local administration were obtained. It was shown that the limbal plexus played the predominant role in delivering the traces to the cornea.

In 1951, von Sallmann and Locke[11] reported the results of their experiments with radiosodium and other indicators in the rabbit eye at various periods following irradiation with 2,000 r. They demonstrated an increased permeability of the blood-aqueous barrier up to six weeks after irradiation but thought this did not play an integral part in the pathogenesis of radiation cataract.

Ophthalmic diagnosis

So much for some of the experimental studies, which have added greatly to our knowledge of the physiology of the eye. There are many others but time does not permit me to relate them here. Let us now consider the value of radioactive isotopes in the field of ophthalmic diagnosis.

For some years, it has been known that malignant tumors take up phosphorus, potassium, and other cell ingredients to a greater degree than do normal tissues. This fact has led to the employment of the radioactive forms of these elements and the measurement of the radiations emitted by the suspected lesion. Without discussing the actual technique of the test, I want to emphasize certain points which seem to me especially important, based on my own experience.

Radioactive phosphorus (P^{32}) first used for intraocular tumor detection by Thomas, Krohmer, and Storaasli[12] four years ago, has continued to be the isotope of choice because of certain well-known advantages. By radio assay, it has been shown to concentrate more in the ciliary body, choroid, and retina, where most tumors are situated, than in the nonvascular tissues or intraocular fluids. It is a pure beta ray emitter whose rays have a maximum penetration of seven to eight mm. in tissue. Hence, a Geiger counter applied in close apposition to the sclera will be counting only those rays coming from the directly underlying tissues and not those from other parts of the eye or the orbit. It has a convenient half-life of 14.3 days so that readings can be taken on successive days if desired. Also, this precludes the danger of excessive total body radiation from average doses. Last and most important is the fact that it is retained longer by malignant melanomas than by normal choroid, iris, or ciliary body and, hence, may be expected to give increased counts over the area of the tumor because of increased uptake by rapidly metabolizing tumor cells. Serous detachments of the retina, degenerative lesions, vitreous hemorrhage, and benign iris tumors do not show this increased uptake. Unfortunately, large inflammatory lesions do, but these can usually be differentiated clinically and, furthermore, they tend to lose this increased concentration by the next day.

While P^{32} seems to be reliable in detecting malignant melanomas situated in the anterior and equatorial region of the eyeball, it has certain limitations which must be borne in mind, otherwise erroneous interpretations will be made.

1. Tumors in the posterior segment, inaccessible to the close application of the Geiger counter, cannot be expected to give

significantly increased counts. It must be remembered that P^{32} has a maximum range in tissue of only seven to eight mm. Actually the half-thickness penetration is only two to three mm. Therefore, it is imperative that the counter must be very close to the lesion to pick up the extra radiations. Unless this is done, a negative test means nothing.

2. When the counter is placed over an extraocular muscle, particularly the medial rectus, the reading is higher than when placed over the sclera alone, due to increased selective uptake by muscle tissue. Therefore, whenever possible, the area of the muscles must be avoided. It is even justifiable to detach the muscle if necessary to complete the test.

3. Because it has been shown that a malignant tumor tends to retain P^{32} longer than normal tissue, the interval between the injection and the counting should be at least 24 hours. Counts taken shortly after injection, when the P^{32} is still diffusing out of the blood stream, will vary tremendously even in different quadrants of a normal eye and, in my opinion, are not reliable. The chance of a good differential between normal and abnormal tissue is infinitely better after a lapse of at least 24 hours, when the concentration in normal tissue has fallen off rapidly.

Most of us working in this field agree that the detection of retinoblastoma by P^{32} has proved unsatisfactory in vivo and, yet, when such an eye is enucleated and the Geiger counter applied directly over the tumor a high count is obtained compared to other quadrants of the same eye. No satisfactory explanation for this has been advanced. Incidentally, it should be mentioned that there are some hazards to using P^{32} in very young children because of its concentration in the immature blood-forming organs.

Besides P^{32}, other isotopes have been employed for diagnostic purposes. Trevor-Roper, Newton, and Nicholson[13] of England reported unsatisfactory results with I^{131} (di-iodofluorescein) in the detection of intraocular malignant melanomas. Apparently this isotope was employed to overcome the inadequacy of P^{32} for detecting lesions in the posterior part of the eyeball. However, I^{131} is chiefly a gamma ray emitter whose deeply penetrating rays coming from back of the eye will obscure the picture by masking the counts coming from the tumor itself. The same objection can be brought against radioactive potassium (K^{42}) and radioactive rubidium (Ru^{86}), which have been employed recently. These isotopes emit both beta and gamma rays and it was hoped that in large posterior tumors they might give rise to sufficiently increased counts over the involved eye to be of diagnostic significance. Such is not the case, however, in my experience.

It would appear, therefore, that up to now nothing has been found superior to the short range beta particles of P^{32}, in spite of its obvious disadvantages in posterior lesions. This is not due to any fault of the isotope but to lack of adequate Geiger counters that can be placed behind the eyeball.

In the diagnosis of certain adnexal malignancies, P^{32} is said to be of value. Bauer and Steffen[14] report that malignant melanomas of the skin can be differentiated from benign nevi by significantly increased concentrations of this isotope, but basal cell and squamous cell carcinomas cannot be differentiated with any degree of accuracy. Terner, Leopold, and Eisenberg,[15] on the other hand, using different criteria for positivity, feel the test is valuable in diagnosing these lesions. The discussion is somewhat academic because most lid lesions are accessible to biopsy and excision.

Therapeutic applications

In the field of therapy relatively little has been done in ophthalmology, comparable to the accomplishments in other fields of medicine, because of the risk involved in damaging delicate ocular structures. However, some of the attempts which I shall mention

are extremely interesting and suggest hopeful possibilities for the future.

There are four ways in which a radioisotope might be used for its therapeutic effect:

1. Intravenous injection with metabolic localization in the lesion.
2. Direct injection into a deeply placed lesion.
3. Local application to an external lesion.
4. Employment of certain substances which capture slow neutrons.

According to Low-Beer,[16] the object of all radiation therapy is the destruction of certain tissues and the preservation of others. This is not always possible where a radioisotope has been injected intravenously. When once introduced into the system, radiation cannot be stopped and the effect on all body structures must be taken into account. The ideal situation would be the metabolic localization of some substance in the eyeball similar to I^{131} in the thyroid. Unfortunately, no substance has been found which is taken up selectively by ocular tissues and, even if one were available, the danger to all the normal ocular structures would be great, if destructive doses were used.

Terner, Leopold, and Eisenberg[15] have pointed out the possibility of achieving therapeutic concentrations in ocular tissues with the initial employment of X-radiation followed by the intravenous injection of a radioisotope which would concentrate in tumor tissue. This idea is based on the work of Ashkenazy, LeRoy, Fields, and Davis,[17] who showed that the uptake of radioactive substances in previously irradiated tissues was greater than in nonirradiated similar tissues. One wonders if this would be practical in the eye, since a delicate balance would have to be struck between a destructive concentration in the tumor and a nondestructive concentration in the normal ocular tissues, which had also been subjected to X-radiation and, therefore, would presumably show an increased uptake also.

Direct injection offers greater hope of success and a number of attempts have been made to destroy ocular tumors and other lesions by this method, using various radioisotopes.

Moore, Stallard, and Milner[18] of England, in 1931, apparently were the first to plant radon seeds directly into a retinoblastoma, although many other attempts to irradiate these tumors by X rays, and by radium needles placed in the orbit, had been made previously by others. Reports on the success of implantation of radon seeds have been variable. Recently Joyce and Scott[19] of Australia have reported a method of treating intraocular melanomas and retinoblastomas by sewing radon seeds, cut from capillary gold wire, into the sclera directly over the tumor, after carefully measuring and localizing it and carefully calculating the dose of destructive radiation required for its size. They report very favorable results.

Trott and Wheatley[20] of England have used radioactive tantalum wire ($_{73}Ta^{182}$) to treat retinoblastomas. This is a gamma ray emitter with a half-life of 111 days. The wire is threaded through a polyethylene tube, heat sealed at each end, which is sewed to the sclera over the tumor area.

Another dramatic use of radioactive tantalum ($_{73}Ta^{182}$) has been reported by Lloyd and Ellis[21] of England to attack a rapidly growing inoperable melanoma of the base of the iris. Two needles, containing the tantalum wire, were passed across the anterior and posterior chambers in the region of the tumor, one behind the iris and the other in front of it, coming out at the opposite limbus. The needles were left in place for 30 hours and then removed, the approximate radiation dose to the tumor being between 4,000 and 6,720 r. The tumor did not shrink but three years after the operation it had not grown larger. An opacity of the lens, present before therapy, increased somewhat as might be expected.

Local injection of a colloidal suspension of a radioisotope into a tumor area so that most of the material will be retained near the injection site has been employed in other

fields of medicine; for example, colloidal gold ($_{79}Au^{198}$) has been introduced into certain body cavities; and chromium phosphate, containing insoluble radioactive phosphorus, has been used with some promise of success in mammary carcinoma of mice but neither of these methods hardly seems applicable to the eye.

An ingenious attempt was made by Shaffer[22] to destroy a recurrent epithelial cyst of the anterior chamber, occurring after cataract extraction, by direct injection of a small amount of astatine ($_{85}At^{211}$) into the cyst. Astatine^{211} has a half-life of only 7.5 hours, emits short-range alpha particles of relatively high energy, which are stopped by 100 micra of tissue. It was felt that this might be just enough to destroy the cyst wall, without damaging contiguous structures. Unfortunately, it was not successful in this particular case but the idea is an interesting one and suggests possibilities for the future. Radioactive cobalt ($_{27}Co^{60}$) may prove to have a limited usefulness in ophthalmology. This is chiefly a gamma emitter of five years' half-life which has been used with success by the urologists in treating carcinoma of the bladder and prostate. I have used cobalt^{60} in one case of retinoblastoma in which, following enucleation, pathologic section showed the cut end of the optic nerve involved. Since irradiation of the socket in such cases is usually unsuccessful, the orbit was re-explored, the optic nerve located with some difficulty, and three fine cobalt needles were threaded down through the end of the nerve toward the optic foramen. These were left in place for 48 hours and then removed, the calculated radiation dose being about 4,000 r. Unfortunately, this attempt was not successful and cerebral involvement occurred later but I think the idea should be pursued. Reese has already used the same method by planting radon seeds in the nerve stump.

Surface application of P^{32} has been tried by Low-Beer[16] for various superficial skin lesions, such as basal cell carcinomas, hemangiomas, and various forms of verruca, any of which may occur on the eyelids. Blotting paper of known dimensions, soaked in a measured amount of radioactive sodium phosphate solution and dried, is applied to the area by adhesive tape. While this method is effective in extremely superficial lesions, it does not influence the deeper ones and, in the opinion of most radiologists, has no advantages over ordinary X-ray therapy with proper shielding of the eye.

For a number of years, beta radiation from a variety of applicators has been used for various superficial ocular lesions. The source employed has usually been radium or two of its degradation products, radon and radium D. More recently, strontium 90, a pure beta ray emitter, has been used. The advantages and disadvantages of these applicators have been comprehensively reviewed by Ham,[23] Hughes,[24] Merriam,[25] von Sallmann, Munoz, and Drungis,[26] Cogan and Donaldson,[27] and others who have studied the effects of beta radiation on rabbit and human eyes and have determined approximately the minimum cataractogenic dosages. From this work, we know that all of them, except perhaps radium D, can produce lens changes unless great caution is employed. The threshold seems to be lower when the applicator is applied over the limbal area than over the center of the cornea. Undoubtedly this method of beta radiation for superficial lesions has its place in ophthalmology. It has proved most useful in vernal catarrh, recurring pterygia, small benign superficial tumors of the lids, and early corneal vascularization. However, those most familiar with it have made a plea for conservatism because of the late effects that are beginning to show up.

The fourth possible therapeutic application is the use of slow neutrons and their effect on boron. It has been known for some years that when the element boron is bombarded by slow neutrons, the boron nucleus captures a neutron, becomes unstable, and emits alpha particles, which can produce

ionization and destruction of tissue.[28] Sweet and Javid[29] have experimented with injecting boron and glycerine intravenously in brain tumor cases and found that the glycerine, while preventing the boron from concentrating in normal brain tissue, did not prevent its increased uptake by tumor tissue. Thus, bombardment of the area with slow neutrons tended to destroy the local tumor without disturbing too much the normal brain. The application of this principle to the eye has never been tried and its effects would be problematical. Theoretically, if the appropriate amount of boron could be injected into an ocular neoplasm and then be subjected to the slow neutron beam, destruction of tumor from short range alpha particles might occur but this is something to think about for the future.

Conclusions

In this talk I have tried to give some of the background of artificial radioactivity so that a better understanding of its clinical applications might be possible. I have also attempted to review briefly the uses that have been made of the radioisotopes in ophthalmology. The question may now be asked: of how much value have they really been in our field of medicine? In answer, I think we can say that in the realm of ocular physiology they have been invaluable. Because of them, we now know fairly accurately the rate of aqueous formation, and the old theory of the aqueous being merely a stagnant dialysate has given way to the newer concept of secretion and flow.

In the field of intraocular tumor detection, P^{32} has proved a definite aid to our clinical judgment, provided certain limitations are recognized. It would be premature to say that it is infallible even in the anterior lesions until more cases have been studied. It is reasonable to expect that, with the development of better instrumentation, the present difficulties of reaching posterior lesions will be overcome. It is possible that other isotopes may be found to be equally good or even better.

In the field of therapy, with the exception of the beta applicators, the radioisotopes have been disappointing so far, but many unexplored avenues exist and the next few years may bring results undreamed of at the present time.

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THE TREATMENT OF RETINOBLASTOMA BY RADIATION AND TRIETHYLENE MELAMINE*

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Since 1953 we have attempted to evaluate a possible additive or synergistic effect of nitrogen mustard analogues and radiation in the treatment of retinoblastoma. In 1955 we gave a preliminary report of our results with the use of triethylene melamine (TEM).

That this group may be effective in the treatment of retinoblastoma is attested by (1) that they have proven lethal to a related tumor elsewhere in the body—the neuroblastoma; (2) that, when used alone in the treatment of four eyes harboring a retinoblastoma, we noted a rapid regression of the tumor. In all four instances by the use of TEM alone the tumor showed a striking clinical regression even though no cure could have been anticipated; (3) that the experimental work of Gillette and Bodenstein in-

* From the Institute of Ophthalmology and the Department of Medicine of the Presbyterian Hospital. This work has been supported by a grant from the Dunlevy Milbank Foundation, Inc., and the Alfred P. Sloan Foundation, New York, New York. We are grateful to Mrs. Virginia Pampellonne for her assistance.

dicates the specific effect of the drugs on the proliferating retinal cells.

In addition, the possibility of synergism between X-radiation and TEM has convincing theoretical and experiental basis through the research of Goldberg and Schoenbach, and of Haddow and others of his group. The work by these authors indicates that the effect of these agents is apparantly at different points on the chromosomes of the dividing nucleus.

In this present communication we wish to present:

1. A study of two comparable groups of eyes treated by X-radiation alone and by X-radiation and oral TEM.

2. Our experience to date with this combination treatment, using TEM orally, intramuscularly, and intra-arterially.

In both groups the cases are consecutive except for the fact that the following were rejected:

a. Hopeless eyes in which no vision would be possible even if the tumor could be arrested. In general, the eyes treated by the combined method had somewhat more advanced lesions.

b. Eyes which had not received the combination treatment concurrently—those which had had radiation first and later, after recurrent growth, the combination treatment was given and those which had a nitrogen mustard analogue first and later after recurrent growth the combination treatment was employed.

c. Cases of residual tumor in the optic nerve after enucleation.

d. Cases of recurrent orbital growth after enucleation.

We have selected the 22 consecutive eyes treated by X-radiation alone just prior to the advent of the use of X-radiation combined with TEM because they were the cases treated with doses of X-radiation less than the original amount which we advocated, that is, 8,000 r × 2 in air. These 22 eyes were treated with doses ranging from 6,800 r × 2 in air to 4,800 r × 2 in air. The cure rate with vision for these 22 consecutive eyes was 50 percent. Of the 50 percent

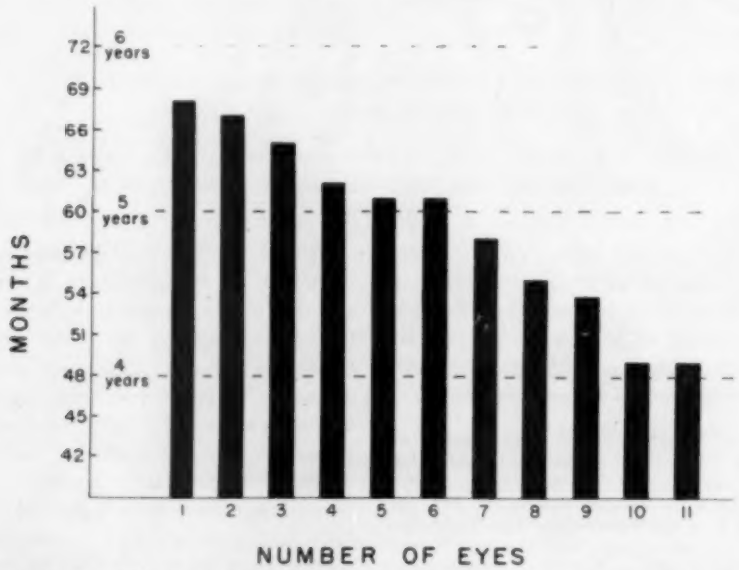

Fig. 1 (Reese, Hyman, Merriam, and Forrest). Time since X ray treatment was started in 11 successful eyes. All show a time elapse of more than four years to more than five years.

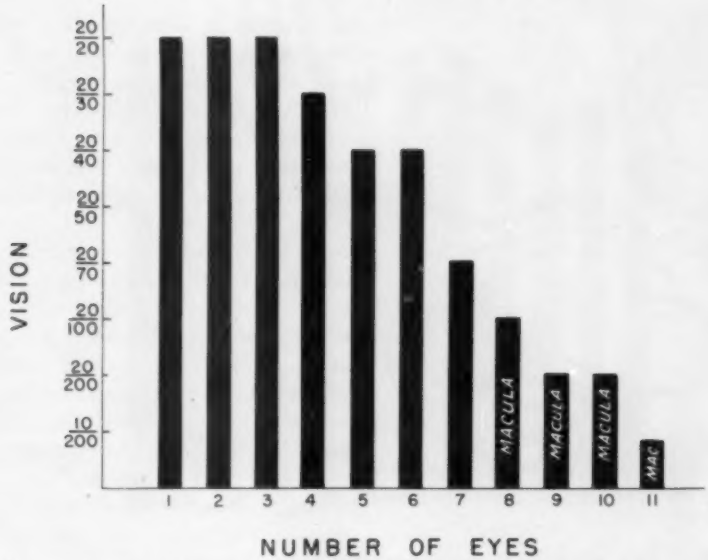

Fig. 2 (Reese, Hyman, Merriam, and Forrest). The vision of the 11 patients with arrested disease by X-ray therapy. The four patients with the poorest vision had macular involvement by the tumor.

failures, eight required enucleation because the tumor was not under control and three had no vision due to vitreous hemorrhages but the tumor was thought to be arrested. The time which has elapsed since the treatment was started on the 11 successful eyes is shown in Figure 1, and the vision which these patients obtained is shown in Figure 2. Figure 3 shows the size of the lesion in eight successfully treated eyes and Figure 4 in four eyes unsuccessfully treated by X rays alone.

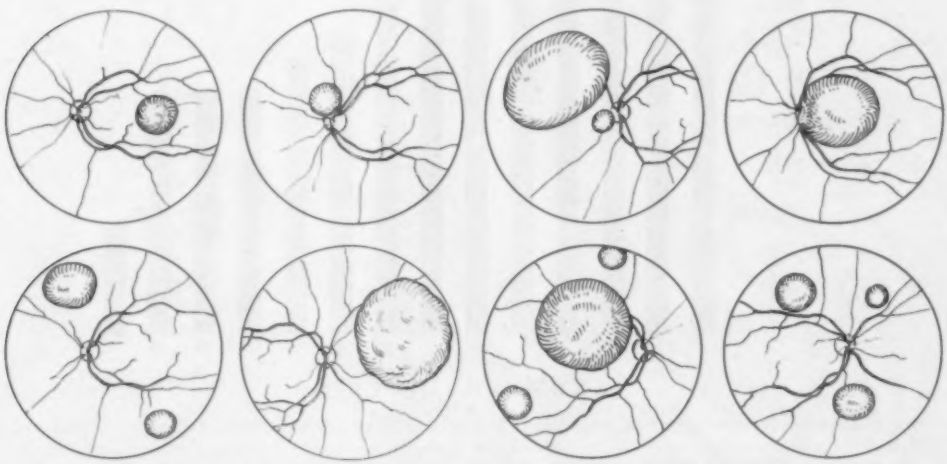

Fig. 3 (Reese, Hyman, Merriam, and Forrest). Diagrammatic sketches of lesions in eight eyes successfully treated by X rays alone. These are shown to give some idea of the size of the lesions which have shown satisfactory response.

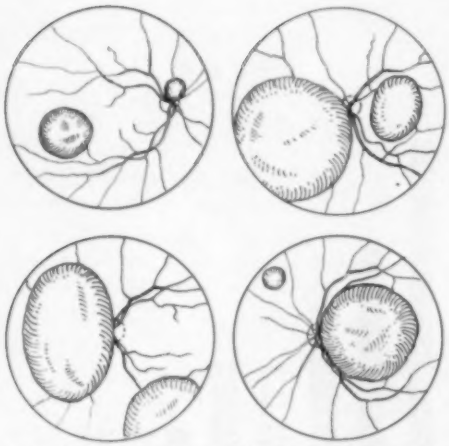

Fig. 4 (Reese, Hyman, Merriam, and Forrest). The size of the lesions in four eyes unsuccessfully treated by X rays alone.

A total of 57 cases of retinoblastoma have been treated since Jaunary, 1953, by a combination of X-radiation and TEM. For comparsion with the 22 consecutive eyes treated by X-radiation alone we have selected the 20 consecutive eyes included in our first report as these have the longest follow-up. The X-ray dose to all these eyes, given according to the method we have previously described, was 2,400 r × 2 in air—a dose one half of the lowest dose in the X-ray series.

All the patients were given triethylene melamine orally with two gm. of sodium bicarbonate in the fasting state according to the method of Gellhorn, and 24 hours later ocular radiotherapy was instituted. The second dose of TEM usually coincided with the last radiotherapy treatment and the third dose was given after radiotherapy was completed but within the time period of its continued direct effect. The optimal timing of these two agents is a matter of further study at present.

Of the 20 eyes so treated 70 percent are cured to date with vision. There have been no vitreous hemorrhages. Figure 5 shows

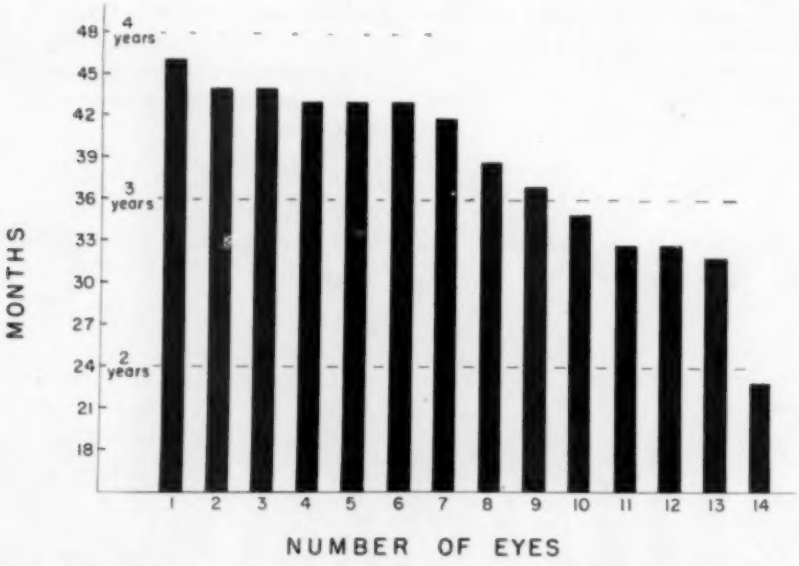

Fig. 5 (Reese, Hyman, Merriam, and Forrest). The time since treatment was started by X rays and TEM in the 14 successful cases.* Here the ordinate begins at 15 months while in the comparable graph in Figure 1, the ordinate begins at 39 months.

* Six more months have elapsed since this paper was prepared and all lesions are unchanged.

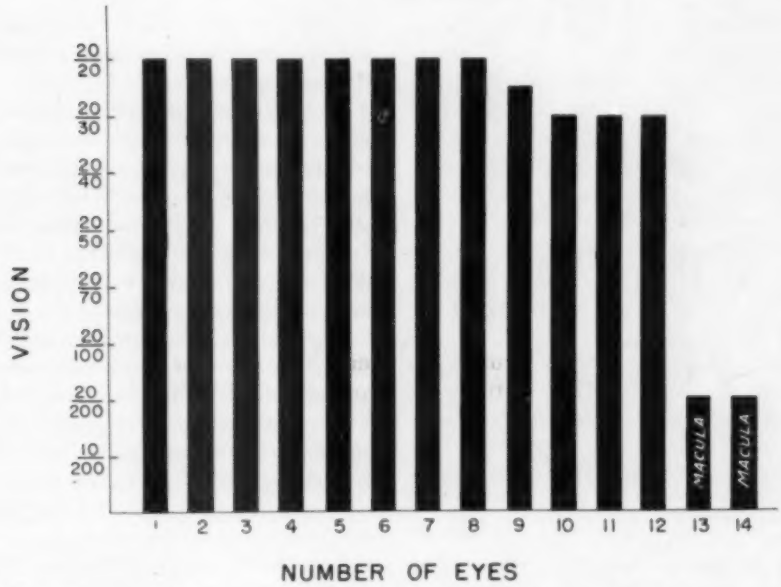

Fig. 6 (Reese, Hyman, Merriam, and Forrest). The vision of the 14 patients with arrested disease by X rays and TEM. The two with the poorest vision had macular involvement by the tumor.

the amount of time which has elapsed since treatment was started in the 14 successful cases. The elapsed time is, of course, greater in the cases treated by X rays than in those treated by X rays and TEM. Figure 6 gives the vision of these patients. Figure 7 shows the size of the lesion in eight successfully treated eyes and Figure 8 in four unsuccessfully treated eyes by the combination method.

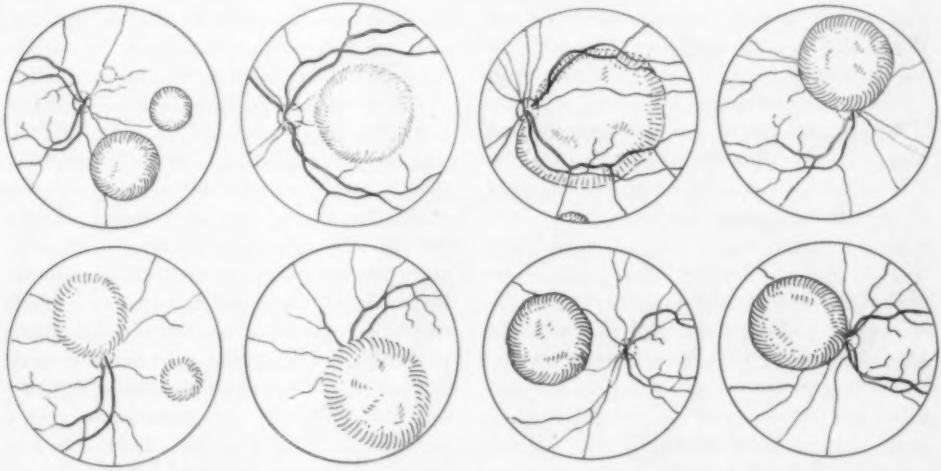

Fig. 7 (Reese, Hyman, Merriam, and Forrest). Diagrammatic sketches of lesions in eight eyes successfully treated by X rays and TEM. These are shown to give some idea of the size of the lesions which have responded.

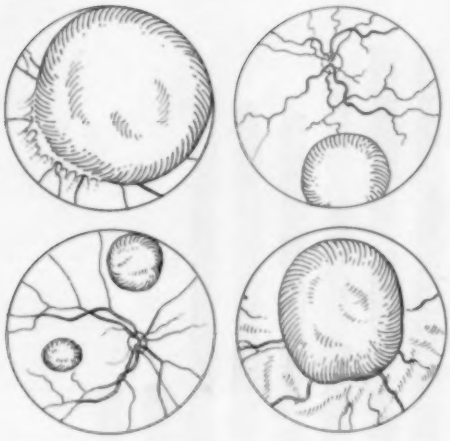

Fig. 8 (Reese, Hyman, Merriam, and Forrest). Sketches of lesions in four eyes unsuccessfully treated by combined X rays and TEM.

It is of interest that 44 percent of the 42 eyes concerned in this report showed two or more tumor foci. This frequency of multicentric lesions is a significant deterring factor in the treatment of retinoblastoma employing radon plaques sutured to the external scleral surface opposite the site of the tumor.

The difference between these two groups is one mainly of more eyes being salvaged with vision with the combined treatment. The difference, though, in the results between the cases treated by X-radiation alone and those treated by the combination method is more manifest if we consider the previous series of 148 children treated by X-radiation prior to the group reported on here. Of the 79 surviving and adequately documented patients the cure-rate with vision was 36 percent but 12 percent had very limited vision (10/200 to hand movements) leaving only 24 percent with useful vision. The vision in general in this group was far below that in the group treated by the combined method. Also in the combined group there are no cosmetic deformities as sequelae of the radiation. Furthermore it may be significant that 18 percent of the children have died in the combined treatment group in 40 months and 35 percent have died in the group treated with X rays alone. Cataract formation has not been a problem in either group.

An analysis of our results from the standpoint of size of the lesion indicates a definite preference for the combined treatment over X rays alone. What will be said here on this point refers entirely to the combined treatment employing TEM orally. We feel that the use of TEM intramuscularly would have highlighted the difference even more. In general the average size of the lesions was distinctly larger in the group treated by the combined method than in the X-ray group. The lesions greater than eight disc diameters in size were usually failures by both methods. X rays alone failed in four eyes with lesions less that 3.5 disc diameters while the combined treatment did not fail in any eye with a lesion of this size. A failure by the combined method was rare (only one case in six) when the lesion measured less than five disc diameters. Failures in this group occurred in five eyes receiving X rays alone. Multicentricity of foci did not apparently affect the cure rate in either group.

We wish to correct here the statement made in a previous report concerning the observation that a tumor observed in transparent media magnified X16 by the ophthalmoscope would allow one in a reasonably short time (six months) to predict whether or not the tumor had been arrested. We find that, although, in general, this statement is true, in three of the eyes we have not detected active growth following treatment until after a longer period had elapsed. The periods were two years 11 months, one year and 10 months, and one year and six months respectively. These are the longest periods which have elapsed between the completion of treatment and detection of active growth. All but one of the cases charted in Figure 5 are now either at or beyond this longest period indicating that we are justified in reporting these as supposed cures.*

* Since this paper was written, six months more have elapsed and all the tumors reported as cured appear arrested.

The 20 cases reported above received combined therapy employing oral TEM. The oral form of TEM now has been discarded because emesis and irregularity of absorption interfere with accuracy of dosage, especially when leukopenia or thrombopenia does not develop. Currently, a new parenteral preparation of TEM† is being employed. It is administered intramuscularly in a dosage of approximately 0.1 mg. per kg. in the fasting state. Using a two-cc. sterile tuberculin syringe throughout, five ml. of normal saline is added to a five-mg. bottle of TEM which has been kept refrigerated. The solution is mixed immediately before administration. The exact amount is withdrawn (equivalent in ml. to mg. of drug) and injected promptly intramuscularly.

Temperatures are recorded every two hours following treatment. The child receives nothing orally for four hours, then water or gingerale for the next four hours, and then other clear fluids for the third four-hour period. If these are well tolerated a full fluid diet is allowed and then a light diet as tolerated after an additional 24 to 36 hours after treatment if afebrile and not vomiting. A moderate leukopenia and/or thrombopenia effect was obtained in almost all cases treated intramuscularly, whereas there were many instances in which mild or no marrow depression was observed following oral TEM.

Because of the variation in individual sensitivity, subsequent therapy in each patient is based on the initial hematologic response as well as the weight. The effective intramuscular dose was approximately one-third to one-half the oral dose, as has been previously reported by Karnofsky. The total dose employed has been empirical with an average course in infants of 15 mg. orally or 7.5 to 10 mg. intramuscularly, extended over a six to 12 months' period. These children apparently tolerate much larger doses than adults since the recommended parenteral dose of triethylene melamine in adults is only 6.0 to 12 mg.

To date we have treated eight patients with TEM intramuscularly combined with X rays and these eight appear at the present time to have tumor arrest. The number of patients treated and the elapsed time are insufficient to warrant a further report now on this group.

In an attempt to increase manyfold the dose of the drug reaching the tumor, TEM has been instilled into the internal carotid artery on the side corresponding to the eye to be treated under direct operative vision in nine cases in doses of 0.1 mg. per kg. Patients were selected for this route (a) when the tumor was found to be very large and enucleation was refused by the parents; (b) when tumor cells were seen histologically at the cut end of the optic nerve at the time of enucleation; and (c) when orbital recurrence of the tumor was present following an earlier enucleation.

In addition to TEM, radiation was given to the eye or orbit and, if necessary, in cases of recurrent growth, orbital exenteration was performed. In this group of nine, two appear to have the tumor arrested and vision preserved; three have died; and an additional four apparently have active disease. Prior to 1953, we would have despaired of helping these children by X rays alone. The number of patients treated and the elapsed time are insufficient to warrant a further report on this experimental group.

Conclusions

1. The treatment of retinoblastoma by a combination of X-radiation and triethylene melamine is more effective than by X-radiation alone.

2. Triethylene melamine employed intramuscularly is more effective than orally.

3. The indications at present are that the use of TEM intra-arterially is most effective and we are now probing the possibilities in advanced intraocular retinoblastoma as well

† Supplied by Dr. James Ruegsegger, Lederle Laboratories, Division of American Cyanamid Corporation, Pearl River, New York.

as in cases of residual and recurrent retinoblastoma in the orbit.

4. The lower doses of X-radiation possible in the combined treatment have led to no vitreous hemorrhages—a complication which plagued us with the doses employed when the treatment was by X-radiation alone.

5. The visual results are better with the combined treatment than with X-radiation alone.

6. With the combined treatment the cosmetic deformities consequent to the radiation are negligible.

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TELANGIECTATIC GRANULOMAS IN AN EYE WITH SPONTANEOUS EXPULSIVE HEMORRHAGE

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In a previous study[1] on the pathology of expulsive hemorrhage, I could demonstrate that these hemorrhages originate from a ruptured necrotic posterior ciliary artery. The necrosis, as well as the ruptures in the arteries, is located by preference at the point where the vessels enter the subchoroidal space. The intrascleral part of the arteries in most instances has a normal structure. The intraocular vascular necrosis is generally due to a combination of glaucoma and high blood pressure or general arteriosclerosis. This combination, however, is not imperative and every one of the three factors mentioned can produce intraocular vascular necrosis by itself.

The previous study did not comprise cases of spontaneous expulsive hemorrhage. A spontaneous expulsive hemorrhage, causing a spontaneous rupture of the globe, is characterized by the fact that it is not preceded by an intraocular operation or a perforation of a corneal or scleral ulcer. These spontaneous ruptures of the globe always occur in glaucomatous eyes (Meller[2]), and they are another argument for the view that glaucoma can produce intraocular vascular necrosis.

Nearly 50 years ago, Gräfenberg[3] described a ruptured posterior ciliary artery as the origin of a spontaneous hemophthalmos in a glaucomatous eye. Since that time, no other anatomically studied case of spontaneous expulsive hemorrhage has been described. It seems worthwhile, therefore, to publish the clinical data and the anatomic findings in a case of spontaneous rupture of the globe due to a spontaneous expulsive hemorrhage. Moreover, the anatomic study of the case revealed peculiar vascular anom-

alies which have not been described before in ophthalmologic literature.

Report of a case

A. J. W., a man-cook, aged 59 years, showed himself at the out-patient department of the Rotterdam Eye Clinic (H. J. Flieringa, M.D.) on July 23, 1953 (No. 13939/'53). He complained of having for some weeks burning sensations in the left eye, as if a foreign body were present. Some small calcified incrustations could be removed from the conjunctiva of the upper lid. Visual acuity of the eye was 8/10.

The right eye had no light perception. The function of this eye had always been very bad since his early youth, when an ocular inflammation had occurred as a complication of a measles infection. The cornea showed a dense vascularization and a heavy diffuse scarring. The corneal limbus could not be exactly located. Two staphylomas were present in the temporal and the superior part of the cornea. The tension of the eye was too high. An electroretinogram of the right eye could not be made; the electroretinogram of the left eye was normal.

On August 22, 1953, the patient reappeared in the out-patient department with the complaint of an acute pain in the right eye. Some blood should have been lost from the eye. It appeared that the superior corneal staphyloma had perforated. A grayish mucous nonpigmented mass, containing some blood, protruded through the perforation. The tension of the eye was too high.

On September 7, 1953, the patient was admitted to the eye clinic. Physical examination revealed a paresis of the left six nerve, due to an operation on the left middle ear about 47 years ago. The systolic blood pressure was 160 m./Hg; the diastolic blood pressure was 160 mm./Hg; the diastolic blood pressure was 85 mm. Hg. No neurologic symptoms were present except for bilateral negative patellar and heel reflexes. The serologic reactions of the blood were negative. On September 8, 1953, the right eye was enucleated.

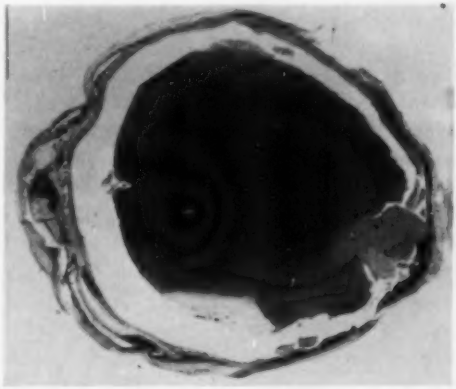

Fig. 1 (Manschot). Lumen of the eye filled by an enormous subchoroidal hemorrhage (sect. 238, ×4).

Pathoanatomic examination (P.A. 171)

The eye was embedded in celloidin and cut in serial sections. Figure 1 demonstrates that the lumen of the eye is completely filled by an enormous subchoroidal hemorrhage. The choroid and the retina are pushed forward into the most anterior part of the eye. Only the anterior part of the sclera is covered by a (double) layer of choroid. The configuration of the hemorrhage indicates that it had its origin in the posterior pole of the eye where an "angiomatous" tissue, which will be discussed later, is present on the inner side of the sclera (fig. 2).

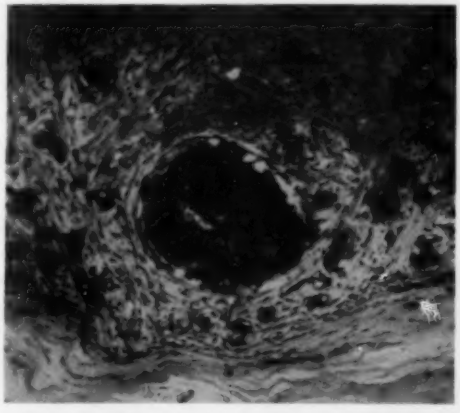

Fig. 2 (Manschot). Detail of Figure 1. "Angiomatous" tissue in the posterior pole (sect. 238, ×140).

The eye showed all the characteristics of a long standing glaucoma. The cornea was heavily degenerated. The irregular epithelium covered a thick, vascularized layer of connective tissue which was largely infiltrated by lymphocytes. The corneal stroma had lost its normal lamellar structure and showed a hyaline degeneration. No anterior chamber was present. The inner side of the cornea was covered by a thin pigmented layer, being the last remnants of the atrophic iris. Calcified parts of the largely resorbed lens were visible in the anterior eye segment.

Figure 3 shows the perforation in the staphylomatous superior part of the cornea. It is clearly visible that no corneal stroma is present at the margin of the gap through which the vitreous has prolapsed. A scleral staphyloma was found in the region of the ora serrata. The optic disc showed a deep glaucomatous excavation. A beginning organization of the intraocular hemorrhage was present in the anterior eye segment where capillaries sprouted from the ciliary processes into the hemorrhage.

The displacement of the entire choroid into the anterior eye segment had caused a rupture of all the short posterior ciliary arteries at the point where they entered the subchoroidal space. By this it was impossible to locate with certainty the ruptured posterior ciliary artery which must have produced the initial stage of the expulsive hemorrhage. It has already been mentioned that the configuration of the intraocular hemorrhage indicated that the origin of the enormous subchoroidal hemorrhage must have been at a point where some "angiomatous" tissue is present on the inner side of the sclera. Figure 2, being a magnification of a part of Figure 1, represents this area.

This "angiomatous" tissue is one of the numerous peculiar vascular anomalies which were found in this eye. All these anomalies have in common that they are formed by a proliferation of cells, resembling fibroblasts, with long spindle-shaped nuclei and a protoplasm which took a light blue color with hematoxylin-eosin stain. These proliferations gave at a first glance the impression that they consisted of angiomatous tissue or canalized thrombus formations, as they contained many blood-filled lumens. At some

Fig. 3 (Manschot). Vitreous prolapsing through the perforated corneal staphyloma (sect. 52, ×80).

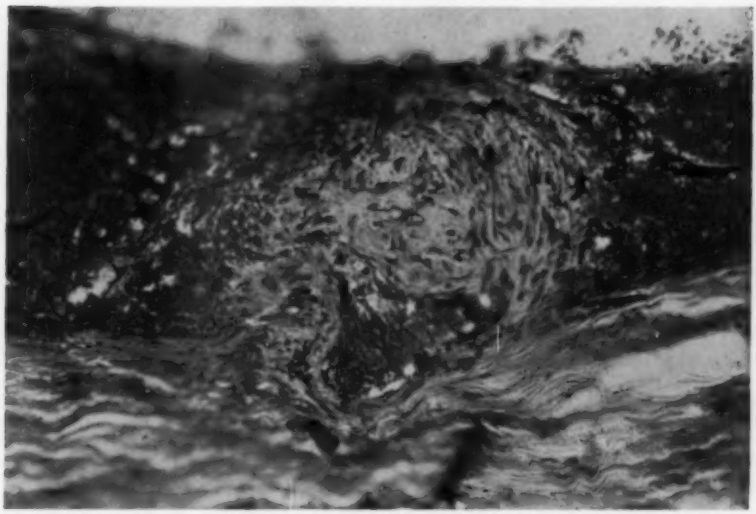

Fig. 4 (Manschot). "Endothelial" proliferation with one large lumen (sect. 310, ×175).

places, however, their structure was rather solid without lumens. This finding as well as the presence of many mitoses in this tissue excluded the possibility of an angiomatous nature of the anomalies. The fact that the structures were not surrounded by a vessel wall, or its remnants, excluded the diagnosis of canalized thrombus formations.

Figure 4 shows a proliferation with one large lumen. This and many similar structures (fig. 2) made it evident that the proliferations were built up by endothelial tissue or fibroblasts which must have had their origin in the intima of the ruptured posterior ciliary arteries. Some of the newly formed structures resembled aneurysmic

Fig. 5 (Manschot). Short posterior ciliary artery with a plane section through one side of an "endothelial" globule (sect. 316, ×175).

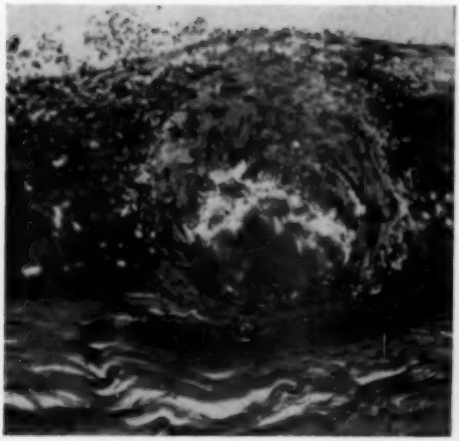

Fig. 6 (Manschot). Same ciliary artery as in Figure 5. The lumen of the globule has entered the sections (sect. 320, ×175).

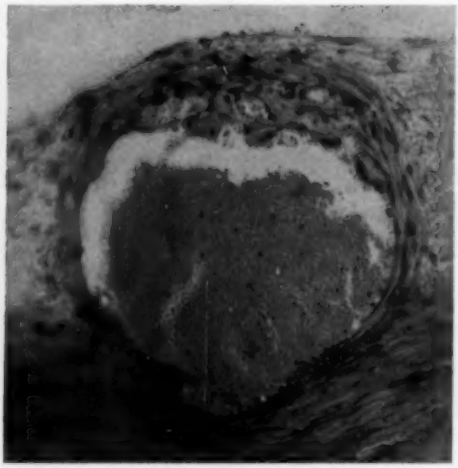

Fig. 7 (Manschot). The lumen of the artery communicates with the lumen of the globule (sect. 328, ×175).

dilated arterioles with proliferations growing into the lumen of the "aneurysms" (figs. 7 and 8). The wall of the "aneurysms" contained, however, no elements of a degenerated vessel wall, and study of the serial sections revealed that the aneurysmlike structures were the cross sections of balloon-shaped thin-walled globules, situated upon the gaping mouth of ruptured ciliary arteries.

Figures 5 to 9 represent sections through one of these globules, all reproduced under the same magnification. Figure 5 shows the intrascleral course of the artery, and the wall of the globule just coming into the sections. Figure 6 again shows the intrascleral part of the artery; in this section the lumen of the globule is already visible. Figure 7 demonstrates the lumen of the artery com-

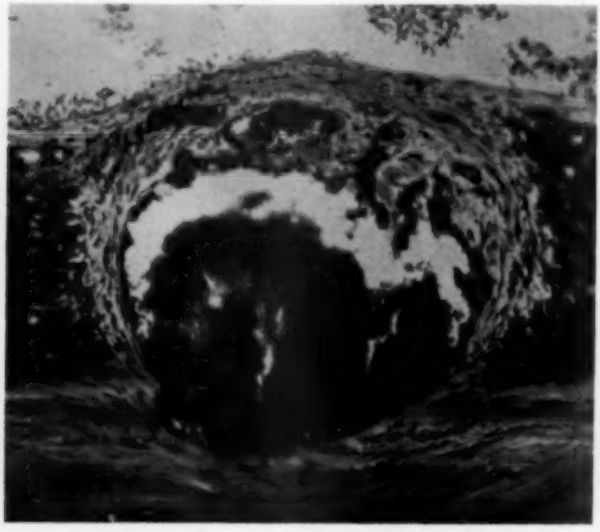

Fig. 8. (Manschot). Processes proliferating into the lumen of the globule (sect. 336, ×175).

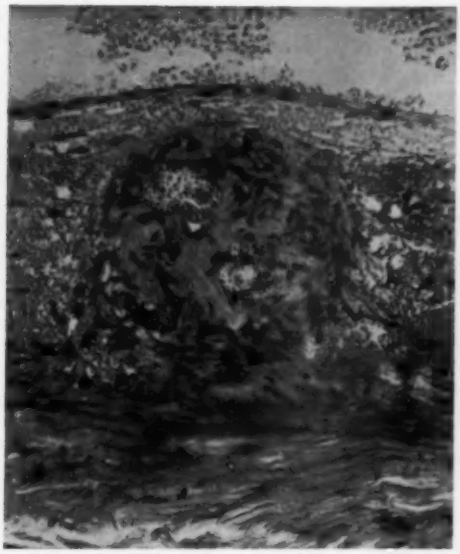

Fig. 9 (Manschot). Plane section through the other side of the globule. The artery has disappeared from the sections (sect. 345, ×175).

municating with the lumen of the globule which has reached its largest diameter. In this figure and in Figure 8 the proliferating processes growing into the lumen of the globule are clearly visible. Figure 9, as Figure 6, represents a plane section through the other side of the globule; the tendency of the proliferating cells to form lumens is evident. No artery is present in the sclera, and the following sections revealed that the globule had completely disappeared from the sections.

In some parts of the eye the proliferating processes had formed complete strands of tissue which crossed the lumen of the globule. Figure 10 represents such strands, and Figure 11 shows one of the many mitoses which were found in the proliferating endothelial tissue or fibroblasts.

Comment

The histologic study of this eye has not demonstrated with absolute certainty the site of the very origin of the spontaneous expulsive hemorrhage. The subchoroidal location

Fig. 10 (Manschot). Another globule with strands which are crossing the lumen (sect. 145, ×175).

of the enormous intraocular hemorrhage has proved, however, that the hemorrhage was caused by a rupture of posterior ciliary arteries. The forward displacement of the choroid caused by the primary hemorrhage subsequently gave rise to a rupture of all

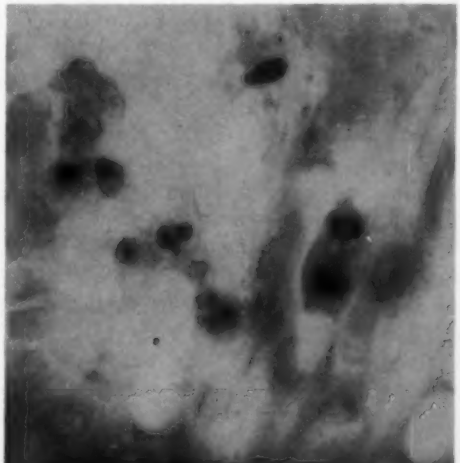

Fig. 11 (Manschot). Mitosis in an "endothelial" strand (sect. 62, ×1250).

short posterior ciliary arteries. The enormous subchoroid hemorrhage originating from all these ruptured arteries resulted in such a high intraocular pressure that a perforation of the corneal staphyloma occurred. The presence of the corneal and scleral staphylomas, the atrophy of the iris, and the deep glaucomatous excavation of the disc prove the presence of a long-standing glaucoma which completes the clinicoanatomic entity of a spontaneous expulsive hemorrhage.

The most interesting finding in this eye, however, is the presence of the endothelial proliferations on the inner side of the sclera. It is impossible to decide with certainty on the morphologic aspects of the proliferating cells whether they are endothelial cells or fibroblasts. This difficulty is facilitated by the ontogenetic development of both cell types.

Altschul[4] states: "While there is the general view that endothelium may turn into fibroblasts, there is the belief that fibroblasts may turn into endothelial cells." This author also mentions that it is the main view by workers on tissue culture that it is difficult or impossible to distinguish between these cell types. The most practical criterion for our purpose is the theoretical consideration that "an endothelial cell, to be an endothelial cell, must line a lumen. If and when it leaves its embarkment, it loses its main characteristic and may no longer be considered an endothelial cell." This consideration implies that a large part of the proliferating cells in the described "endothelial" structures in reality are fibroblasts. Only the proliferating cells which form the numerous lumens in these structures may be considered as endothelial cells.

Altschul also states, however: "It is quite generally agreed that only in early life does endothelium develop from mesenchymal cells; in later life it can develop only from other endothelial cells." This statement justifies the conclusion that the many proliferations found at the inner side of the sclera in the above described eye essentially are endothelial proliferations, originating from the intima of the ruptured short posterior ciliary arteries. They may be labeled as *telangiectatic granulomas of the arteriolar intima.*

Some of these granulomas showed a fibrinoid necrosis in their peripheral parts. This was especially marked in the proliferation reproduced in Figure 2. The photograph, however, does not demonstrate this necrosis sufficiently.

The occurrence of the telangiectatic granulomas has been made possible by the circumstance that the enucleation of the eye was postponed to at least 17 days after the occurrence of the subchoroidal hemorrhage. In the meantime the gaping ruptured ciliary arteries have made an attempt to stop the bleeding by means of endothelial proliferation. The proliferations have protruded into the eye and have formed structures which gave at a first glance the impression of canalized thrombus formations or angiomatous tissue. At some points the arteriolar blood pressure has stretched the endothelial "plugs" into balloon-shaped membranes, situated as globules upon the gaping mouth of the arteries. These membranes are formed by the same young proliferating endothelial cells which constitute the processes and strands within these globules. The presence of many mitoses in this proliferating tissue proves that the proliferative process was in full progress at the time of enucleation.

Summary

A case of spontaneous expulsive hemorrhage in an eye with long-standing glaucoma is described. The subchoroidal hemorrhage had caused a total detachment of the choroid by which all short posterior ciliary arteries were torn off at the point where they entered the subchoroidal space. The enucleation of the eye was postponed to at least 17 days after the occurrence of the expulsive hemorrhage. In the meantime the endothelium of the ruptured arteries had

proliferated into the lumen of the eye at many points, causing endothelial tumors of different size and structure. Some of these tumors were stretched by the arteriolar blood pressure into thin endothelial balloon-shaped membranes. Processes and strands of endothelial tissue were proliferating from the wall into the lumen of these globules. The presence of many mitoses in this tissue proves that the proliferative process of the vascular endothelium was still in full going at the time of enucleation. It seems justified to label the endothelial proliferations in this eye as *telangiectatic granulomas of the arteriolar intima.*

Nieuwe Binnenweg 157.

ACKNOWLEDGMENT

I am greatly indebted to Prof. W. P. C. Zeeman, M.D., Norman Ashton, M.D., and M. Straub, M.D., for discussing the histologic sections.

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OCULAR REACTIONS FOLLOWING IODIDE THERAPY*

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INTRODUCTION

Iodine-containing compounds have been used extensively for therapeutic as well as diagnostic purposes. Iodides, especially potassium iodide, are used for absorbing exudates, gummas, hemorrhages, for stimulating bronchial secretions, and so forth.

Intolerance to iodides is not too unusual. Swinny[1] believes that five percent of all patients given iodides will have reactions. The most common manifestations of so-called iodism are swelling of the salivary glands, acneform dermatitis, sialorrhea, bronchorrhea, and tearing. However, various severe reactions following the administration of iodides have been reported in the literature; fortunately, these reactions are rare.

The clinical picture of some of the serious reactions was consistent with an underlying vasculitis.[2] Some of the cases with a severe vasculitis ascribed to iodide hypersensitivity have been fatal.[2,3] Rich,[4] and others[2,5] have clearly implicated iodide hypersensitivity as one of the causes of periarteritis nodosa. Fever, abdominal pain, and hemorrhages in the intestinal tract and mucous membranes have been reported following the use of potassium iodide.[6]

On review of the literature one also finds that unusual ocular reactions have resulted from oral administration of iodides. Keratitis, hypopyon, and iritis have all been described following oral iodide therapy.[7-9] Lewin,[10] in 1899 and 1925, recorded retinal hemorrhages and bullous corneal lesions as resulting from iodide administration.

Recent experiences with three patients having reactions following the use of iodides were considered noteworthy and prompted the reporting of these cases.

CASE REPORTS

CASE 1

E. S., a 56-year-old white woman and known asthmatic and hypertensive, was admitted to the hospital June 15, 1955, with a diagnosis of pneumonitis. The temperature on admission was 102°F. and X-ray examination on admission revealed bilateral infiltrative lesions of both upper lung fields.

* From the Departments of Ophthalmology, Evanston Hospital and Northwestern University Medical School.

The patient was placed on penicillin and tetracycline hydrochloride; she showed marked clinical improvement and was afebrile after two days. After one week both the penicillin and the tetracycline were discontinued. However, the cough persisted and two weeks after admission, X-ray examination of the chest showed scattered patches of consolidation in both upper lung fields. Direct smear of the sputum and culture was negative for acid-fast bacilli. A positive sputum culture of Candida albicans was reported.

On July 4th, almost three weeks after admission, enteric-coated tablets of potassium iodide (one gm. four times daily) were ordered for the persistent cough. The following day at noon the patient complained of occipital headache, nausea, and visual disturbances followed that evening by severe pain around the eyes and forehead. The temperature rose to 102°F. On July 6th, two days after the potassium iodide was started, an acneform rash appeared on the neck and upper chest, and edema of the eyelids and face, as well as conjunctival edema and rhinorrhea, were present. There were punctate staining areas of both corneas with fluorescein. Abdominal tenderness was also noted. The severe headache and nausea persisted and the potassium iodide was discontinued that evening.

On July 7th, the following morning, the patient became acutely ill, vomited, and had marked tenderness in the epigastrium and right upper quadrant of the abdomen. She complained of pain in the left knee as well as excruciating headache. She also noted that she could not see with either eye. The temperature remained at 102°F.

On ocular examination there was questionable light perception bilaterally; the lids were markedly edematous, the conjunctivas chemotic and hemorrhagic, and the corneas hazy with punctate staining areas. Folds were present in Descemet's membrane and there was fresh blood in both anterior chambers. The pupils were small and no fundus reflex was seen in either eye.

The white count during this acute episode varied between 10,000 and 12,400, but at no time were more than three-percent eosinophils noted in the differential count. Penicillin and tetracycline hydrochloride were restarted. The patient gradually improved, the abdominal tenderness, nausea, headache, and fever persisting for about four days. The hyphema disappeared in three days, the corneas cleared and the vision gradually improved from light perception and projection two days after the onset of the acute episode to hand movements 10 days later. Posterior synechias were present bilaterally and considerable difficulty was encountered in dilating the pupils with 10-percent neosynephrine and four-percent homatropine.

When the fundi could finally be visualized through the vitreous haze about four weeks later, large vitreous floaters were seen in each eye which had not been present on examination previous to the present illness. About six weeks after the onset of the sudden visual loss, fundus examination, with the exception of the vitreous floaters, was essentially the same as had been noted on examination several months prior to the onset of the present illness. Vision returned to 20/40 in the right eye and 20/100 in the left, the same acuity as had been noted on examination before the present episode. Posterior capsular lens opacities made it unlikely that further visual improvement would follow.

This patient gave no previous history of iodide therapy. A patch test of 25-percent potassium iodide in petrolatum was applied to the right forearm in an attempt to determine iodide hypersensitivity, but this was negative. On advice of an allergist[11] scratch tests and intradermal tests with potassium iodide were not used. This was considered a dangerous procedure in this case because of the possibility of a severe systemic reaction. It was also felt that a negative intradermal test would not rule out iodide hypersensitivity.

Case 2

The second patient, a 74-year-old white man, was hospitalized because of bilateral pulmonary lesions of undetermined etiology. He gave a history of chronic cough of several years' duration and because of this was given large oral doses of potassium iodide. Sputum cultures had been negative for acid-fast bacilli.

After four days of potassium-iodide therapy he noted burning of his eyes and visual loss. On examination, the eyelids were edematous, the conjunctiva markedly hyperemic, and the cornea diffusely hazy and of ground-glass appearance bilaterally. There were punctate staining areas of both corneas with fluorescein. The iris markings were barely visible due to the haziness of the corneas. Vision was limited to hand movements in each eye but, through the hazy corneas, a faint fundus reflex was present.

The iodides were discontinued, the corneas and conjunctivas cleared, and the vision returned to normal in several days. Fundus examination was normal. This patient died one week later from an acute myocardial infarction—his fourth in 10 years, and no post-mortem examination was done.

Case 3

The third patient exhibits an allergic response to the topical use of iodine. This patient, a 61-year-old white man, was seen with an herpetic keratitis involving the left eye. Gifford's solution, containing tincture of iodine, glycerine, iodine crystals, and potassium iodide solution, was applied to the herpetic ulcer. The following day the patient developed marked edema of the lids, follicles of the palpebral conjunctiva, bullae of the cornea, as well as generalized urticaria. He then gave a history of urticaria and salivary gland enlargement following the use of sodium iodide for thyrotoxicosis several years previously. His allergic symptoms disappeared promptly with the administration of antihistamines.

Comment

Iodide sensitivity through allergic mechanisms is a well-documented phenomenon.[12] The etiologic diagnosis of drug allergies is difficult and must frequently be made on a clinical basis. Conventional laboratory methods used in diagnosis of allergies as a rule are unsatisfactory in the study of drug sensitization.[13] Swinny[1] states that skin tests for iodides in any form are without value. Apparently the only reliable test is avoidance of the suspected drug and then re-administration.[13] However, Sheldon, Lovell and Mathews[13] state that this must *never* be done with certain drugs including iodides, as a fatal reaction may occur following a test dose. In the first case penicillin and tetracycline were re-administered to the patient with no untoward effects. This would eliminate these drugs as an etiologic factor in this instance.

Summary

Three cases have been presented with unusual reactions following the administration of iodides. The first two patients gave no history of previous use of potassium iodide. The first patient, I believe, exhibits a severe generalized vascular reaction following the use of iodides, the second an allergic response limited to a keratitis, and the third an allergic response to the local application of a solution containing iodine and potassium iodide. The withdrawal of the drug prompted disappearance of the symptoms in all three individuals.

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Ophthalmic Miniature

In the month of Lent a kind of rheumatic ophthalmia is rife; the cause of it (which may hardly be imagined in countries of a better diet) is the drinking of cold water to bedward, as it is chilled in the girbies; and perhaps they slept abroad or uncovered, and the night's chill fell upon them towards morning, when they are in danger to waken with the rime about their swollen eyelids.

G. M. Doughty, *Arabia Deserta*, 1921.

TREATMENT OF EALES' DISEASE: DIATHERMY COAGULATION*

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Eales' disease occurs predominantly in young male adults of an average age of 23 years. Usually there is extensive involvement of one eye followed at a later date by involvement of the second eye. The hemorrhage can be in the retina, choroid, or vitreous and is recurrent in type. Occasionally exudates are also present. In many cases vision is greatly reduced due to the vitreous opacities, and all view of the fundus is obscured.

The etiology has been investigated by many ophthalmologists since first described by Eales.[1] Gilbert,[3] 1935, Fleischer,[4] 1914, Löwenstein,[5] 1931, Finnoff and Reynolds,[6] 1933, Ohmart,[7] 1933, and von Hippel,[8] 1935, all claimed tuberculosis was the etiologic agent. Others claimed septic foci to be responsible, while still others claimed hematologic or vascular abnormality. Paton,[9] 1938, proposed a hematogenous origin.

In reviewing the literature we find all types of treatment advocated for this condition. Duke-Elder[2] recommends rest, treatment of etiology if known, and tuberculin therapy. Guyton and Reese[16] treated eight cases with X-ray therapy restricted to the posterior segment of the eye. A. J. Elliot[10] reported on 23 cases, three of which were given cortisone or ACTH. He states there is no specific treatment of the condition. Sykowski,[11] and Woods[12] used streptomycin or streptomycin and promizole with good results, and, lastly Verhoeff,[14] Franceschetti,[13] and Vail[15] all advocate and recommend electric cautery over scleral surfaces. Superficial coagulation of zones presenting vascular alterations and hemorrhages gave excellent results. It was Vail's suggestion that this treatment be tried in this case. Kimura and co-workers[17] reported on 21 cases and reviewed various treatments. No surgical treatment was recommended by them. No tuberculous lesions or acid-fast organisms were found.

CASE REPORT

History. This 26-year-old man was admitted to Veterans Research Hospital on May 3, 1955, with the following history:

In January, 1955, he noted some "hair-like" opacities and floaters in the visual field of the left eye. These were followed in about one week by a gradual but progressive blurring of the vision in the left eye, which occurred over a period of one week.

He was examined and a diagnosis made of intraocular hemorrhage of the left eye. He was admitted to a local hospital in the Chicago area where he stayed approximately 10 days. He was given numerous tests and medical treatment, the exact nature of which is not known. The vision slowly cleared in the left eye while in the hospital. At the time of discharge he "could see quite well."

No further symptoms were noted until March, 1955, when there was a recurrence of the visual blur in the left eye. This spontaneously and gradually cleared, and at the end of six weeks his vision was again what he considered normal. On April 30, 1955, the presence of black spots before the field of vision in the right eye became apparent. This caused the patient sufficient anxiety that he entered Veterans Research Hospital for diagnosis and treatment.

Physical examination. At the time of admission the visual acuity of the right eye was 20/20, and in the left eye 20/30, uncorrected. Detailed examination of the right eye revealed a normal-appearing anterior segment and a normal adnexa. The media showed occasional small vitreous floaters. The tension was normal.

* From the Department of Ophthalmology, Northwestern University Medical School and the Veterans Administration Research Hospital.

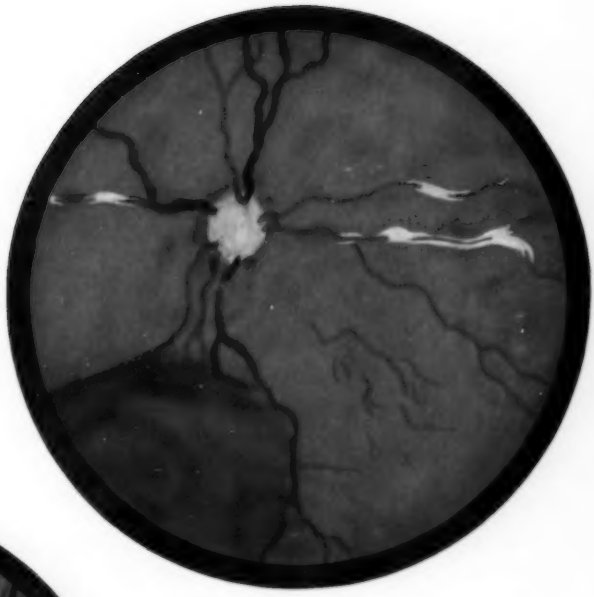

Fig. 1 (Merz and Hauser). Appearance of the fundus prior to surgery.

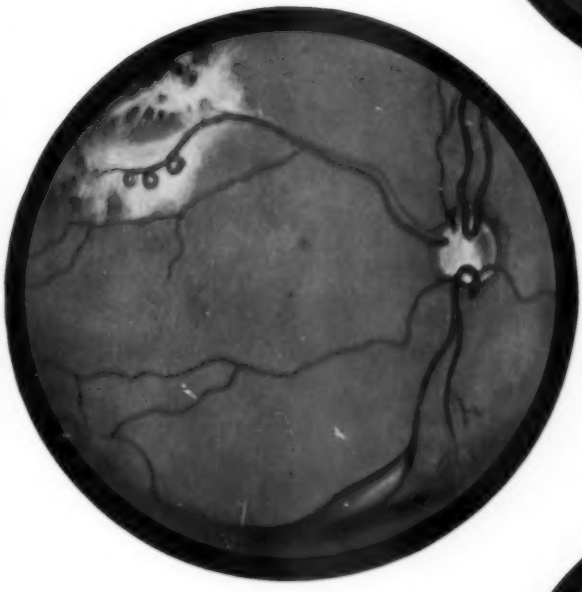

Fig. 2 (Merz and Hauser). Appearance of the fundus six weeks after surgery.

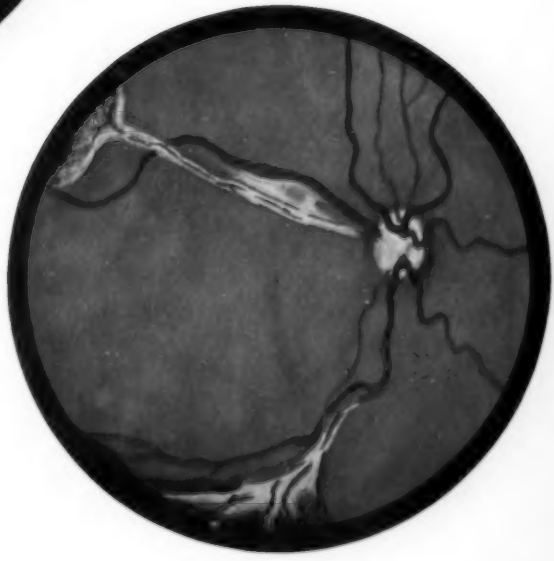

Fig. 3 (Merz and Hauser). Appearance of the fundus one year after surgery.

The funduscopic examination revealed a marked and extensive degree of retinopathy. The arteries in some places were markedly constricted to the point where the blood column was almost obliterated. In several places the arteries were lined by a white infiltration which was two or three times the breadth of the vessel itself. Throughout the retina were numerous hemorrhages, some round, and some flame-shaped, and one large preretinal hemorrhage. The pathologic alterations were most marked in the periphery in all quadrants. The optic disc was normal in appearance.

The left eye revealed a normal anterior segment and adnexa. The funduscopic examination revealed the vitreous filled with numerous vitreous opacities of many shapes and sizes. The media were very hazy. The disc was normal. The retina showed numerous hemorrhages and exudates throughout the peripheral portion. A diagnosis was made of a recurrent intraocular hemorrhage (Eales' disease).

Laboratory data. Since the diagnosis of Eales' disease was made, a complete physical examination and laboratory study was in order. This included: (1) gastric washing for acid-fast bacilli, (2) 24-hour total urine for acid-fast culture, (3) X-ray examination of the chest in all views, (4) coccidioid skin test, (5) Feldman-Sabin dilution dye test for toxoplasmosis, (6) brucella agglutination tests, as well as blood chemistry, blood counts, Wassermann, and Kahn tests. All these tests proved to be negative. The patient was then given a tuberculin skin test as a diagnostic procedure, which was followed in 36 hours by a severe vitreous hemorrhage in the left eye. The skin test was positive.

Hospital course. Following the hemorrhage in the left eye, the vision was reduced to light perception only, while vision in the right eye remained 20/30+3. Conservative treatment consisting of bedrest, adequate diet, and vitamin therapy was advised.

Because of the vitreous hemorrhage following the skin test, the Medical Department was asked in consultation to verify the diagnosis of tuberculosis or to rule out definitely blood dyscrasias, periarteritis, hypertension, and so forth. After extensive examination, no conclusion could be reached, and, as a therapeutic test, the patient was placed on PAS and streptomycin. While on this treatment, a new and large hemorrhage appeared in the vitreous of the left eye which obscured the fundus and obliterated the red reflex.

On June 14, 1955, Dr. Derrick Vail was asked to see the patient, and he reported as follows:

"In the right eye the vitreous shows some exudation, preretinal and scattered hemorrhages with two areas of localized periphlebitis along the superior temporal vein and inferior temporal vein. The macular area is so far unaffected. The left eye fundus was not seen due to a vast, massive hemorrhagic exudation. Diagnosis: Eales' disease, bilateral. Treatment: Streptomycin, PAS, Isoniazid, and diathermy coagulation to the affected areas of the right eye."

The exact location of the offending vessels was outlined and, on June 21, 1955, the patient was taken to surgery and a flat diathermy point was used to coagulate superficially the sclera over the superior temporal vein and inferior temporal vein. Direct visualization with the ophthalmoscope was used to determine how much coagulation was needed. Following surgery, no hemorrhage or complication could be seen. The patient made an uneventful recovery with normal scarring and pigmentation. No further hemorrhages have been seen in this eye since surgery (14 months).

The left eye has had repeated vitreous hemorrhages and now no red reflex is present. A vitreous transplant was attempted but the exudation and hemorrhagic mass could not be removed from the retinal surface. No cauterization was advised because localization of the offending vessel was not possible.

The patient was last seen in September, 1956, when vision in the right eye was 20/20, and light perception only in the left eye. No new hemorrhages or exudates were seen in

the right fundus. A true rete mirabile was present. Old choroiditis was present from surgery. The left eye had such a heavy mass present that a view of the fundus was not possible.

Discussion

The outlook for retaining any vision in either eye of this patient seemed quite poor because no etiologic factor could be found and all conservative treatment seemed of no benefit. Duke-Elder[2] states that, in some cases, the hemorrhages become less frequent and many cease altogether but, in this case, there was no sign of spontaneous cure.

Tuberculosis therapy, consisting of streptomycin and PAS, did not prevent further hemorrhage. Dr. Derrick Vail's localization of the offending blood vessels with advice to obliterate them with diathermy proved most satisfactory.

These lesions are usually seen in the periphery of the fundus, are easy to reach with diathermy, and the danger is not too great. Enough surface diathermy was given to assure complete obliteration but care was exercised not to cause excessive necrosis. Since the vascular tree could not be seen in the second eye, no localization was possible and diathermy was not used.

Conclusion

In recurrent intraocular hemorrhages in young adults, early surface diathermy is advocated if the offending vessel can be seen and localization obtained. The cautery is applied directly over the involved area of sufficient strength to occlude the vessel. It is recommended this be done early before vitreous hemorrhage or loss of vision makes the prognosis poor.

30 North Michigan Avenue (2).

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THE EVOLUTION OF HYALINE CORPUSCLES (CYTOID BODIES) IN THE HUMAN OPTIC NERVE*

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Round corpuscles of hyaline substance are a common histologic finding in the optic nerve and in the retina of human eyes under pathologic conditions and in senescence. Such corpuscles are known as "cytoid bodies" or "ganglioform swellings." It has been demonstrated that these hyaline bodies of the retina may represent the final stage of degeneration of different cellular elements (Elwyn,[1] Friedenwald,[2] Maumenee,[3] Wolter,[4,5] Wolter, Goldsmith, and Phillips[6]). However, there is virtually no information on the nature and origin of the hyaline bodies of the optic nerve.

The present study represents a histologic description of such hyaline bodies in the optic nerve of a case of primary atrophy of the optic nerve following compression of its intracranial part by a meningioma. The histologic observation of different stages of the development of these corpuscles allows a discussion of their origin and significance in this case. The most common type of hyaline bodies of the nerve-fiber layer of the retina is described for comparison.

Case history

This white woman died in October, 1956, at the age of 75 years, while a patient of the Ypsilanti State Hospital, with the diagnosis of bilateral pneumonia and an organic brain syndrome due to arteriosclerosis. At post-mortem, however, she was found to have an intracranial tumor which histologically proved to be a meningioma. This tumor had compressed the left optic nerve intracranially and obviously caused the eye symptoms which were clinically observed before death: blindness due to primary atrophy of the optic nerve, O.S., complete ophthalmoplegia, O.S., proptosis, O.S., left facial hypesthesia, and right facial paralysis.

The left globe and the left optic nerve were obtained for histologic examination and immediately fixed in bromformalin (Cajal solution).

Method of histologic examination

Half of the globe was imbedded in paraffin, cut in serial sections, and studied by routine methods of eye pathology. Frozen sections were made of the retina of the other half and of the optic nerve. These sections were stained with the method of "double impregnation without reduction" of del Rio Hortega as described by Scharenberg and Zeman.[7] All illustrations presented in this paper are unretouched photomicrographs.

Histopathologic findings

The retina of this case exhibited extensive degeneration of the ganglion-cell layer and of the nerve-fiber layer. Only a few ganglion cells and nerve fibers were left and many of them showed advanced atrophy. Hypertrophic astroglia had filled the space of the destroyed neurons of these inner layers and formed a scar of proliferating astrocytes with long processes (glial fibers). The outer layers of the retina showed relatively little damage.

There was also advanced atrophy of the optic nerve. Macroscopically, the optic nerve was smaller and there was a larger space between its dura and pia than normal. The histologic study showed that most of the nerve fibers of the optic nerve were absent. Relatively few fibers had survived in the bundles of the optic nerve (figs. 1 to 4). There was extensive hypertrophy of the astroglia (fig. 5) and of the septal connective tissue. Both the hypertrophic connective tissue and the astroglia filled the space of the missing nerve fibers.

Many of the surviving nerve fibers did not run up to the brain—as they normally do—but exhibited distinct interruption at

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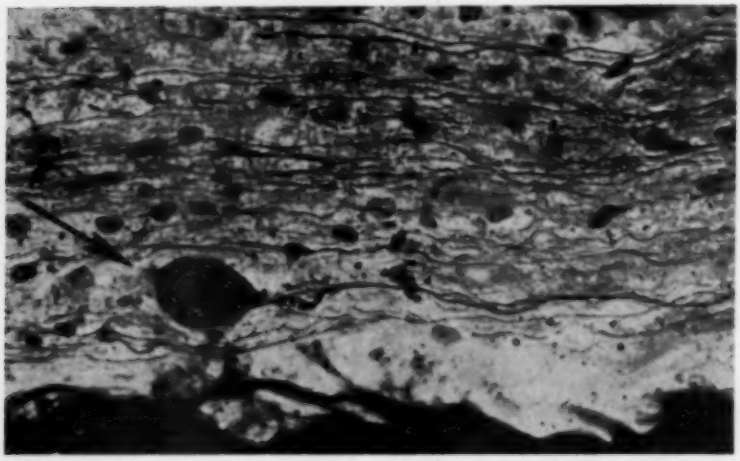

Fig. 1 (Wolter and Liss). Nerve-fiber bundle of optic nerve of the 75-year-old patient after intracranial compression by a meningioma. One nerve fiber is interrupted and shows a large terminal swelling (arrow). Black-stained tissue in lower part of photograph represents part of septal connective tissue. (Hortega method, photomicrograph, ×400.)

different points of their course through the optic nerve. At the proximal end of each interrupted fiber, there was always a large terminal swelling (figs. 1 and 2). These bizarre swellings were composed of nerve-fiber substance and free lipoids. They were many times larger than the diameter of the nerve fibers and had a bulblike shape.

This optic nerve also contained numerous hyaline corpuscles. These corpuscles had about the same size as the terminal swellings of interrupted nerve fibers (figs. 1 to 4). They were round or oval in shape and sometimes showed a somewhat lamellar structure. These bodies were always seen in the nerve bundles but not in the connective tissue of

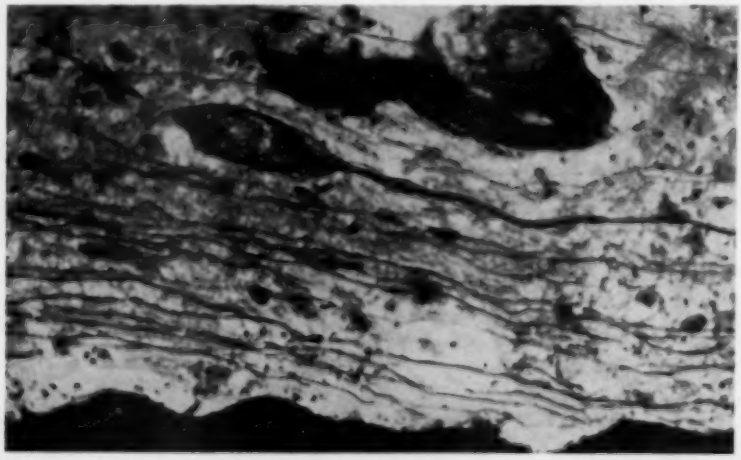

Fig. 2 (Wolter and Liss). Nerve bundle of human optic nerve of the 75-year-old patient with intracranial compression by a meningioma. One nerve fiber is interrupted. The surviving stump shows a typical terminal swelling (arrow). Dark structures in the photograph represent parts of septal connective tissue. (Hortega method, photomicrograph, ×400.)

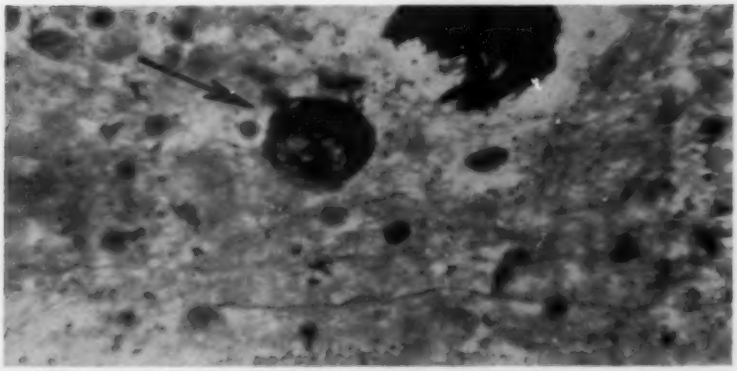

Fig. 3 (Wolter and Liss). Lipoid body (arrow) in a nerve bundle of the intracranially compressed optic nerve of the 75-year-old patient. (Hortega method, photomicrograph, ×400.)

the optic nerve. No connection between the fully developed hyaline bodies and any other elements of the optic nerve could be demonstrated.

However, all stages of transitional formations between the bulblike terminal swellings of interrupted nerve fibers and the hyaline bodies were observed. After careful study of all sections of the optic nerve of this case, the development of the hyaline bodies could be understood as follows:

In the process of retrograde nerve-fiber degeneration after intracranial compression there occurs interruption of nerve fibers in the optic nerve (figs. 1 and 2). Coarse terminal swellings composed of nerve-fiber substance and lipoids develop at the proximal end of such nerve-fiber stumps. The nerve fibers with such terminal swellings may exist for some time. Finally, however, the process of retrograde degeneration results in the destruction of the more distal parts of these nerve-fiber stumps. The terminal swellings remain in the optic nerve as round bodies of lipoid substance while the more distal nerve fiber disappears (fig. 3). Later, these lipoid bodies become hyalinized (fig. 4).

The astroglia cannot be responsible for the formation of the hyaline bodies in the optic nerve of this case. There were no degeneration or other changes which could

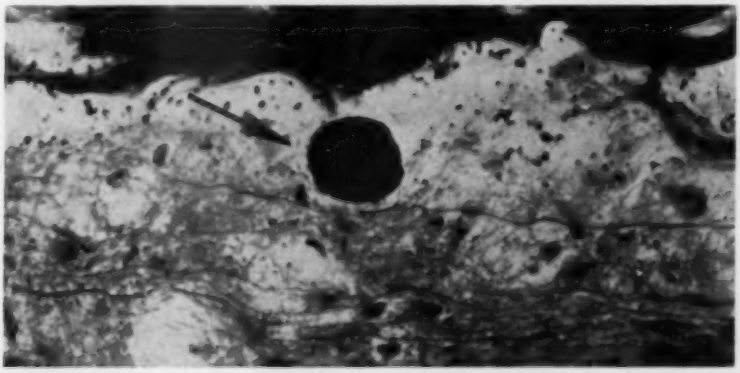

Fig. 4 (Wolter and Liss). Hyaline body (arrow) in a nerve bundle of the intracranially compressed optic nerve of the 75-year-old patient. (Hortega method, photomicrograph, ×400.)

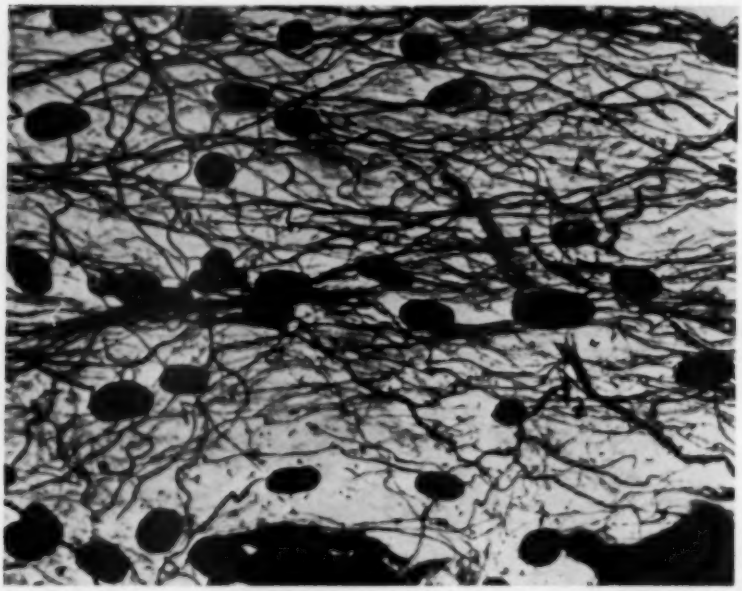

Fig. 5 (Wolter and Liss). Hypertrophic astroglia of a nerve bundle of the intracranially compressed optic nerve of the 75-year-old patient. A dense network of processes of astrocytes (glial fibers) fills the space of the missing nerve fibers. (Hortega method, photomicrograph, ×400.)

have resulted in the formation of such hyaline bodies in the astrocytes.

Hyaline bodies of the same type of development as in the optic nerve of this case can be commonly observed in the human retina. Figure 6 shows three typical nerve-fiber stumps with terminal swellings in the nerve fiber of the retina of a patient with diabetic retinopathy.*

Figure 7 shows another area of the nerve-fiber layer of the same retina. In this area, however, the degeneration of the nerve fibers is more advanced. Most of the nerve fibers have disappeared and only round lipoid bodies are left. These lipoid bodies represent the remnants of the terminal swellings of nerve-fiber stumps. They may become hyalinized and remain in the tissue. Figure 8 shows similar bodies in the nerve-fiber layer of the retina of a patient with old retinal detachment.

The development of hyaline bodies of nerve-fiber origin in the human optic nerve and retina does not always start from terminal swellings of already interrupted nerve fibers. In the nerve fibers of optic nerves and of the nerve-fiber layer of eyes of aged people there often occurs another type of development of such bodies. Accumulation of hyaline there is found within continuous nerve fibers which otherwise look histologically quite normal (fig. 10 A, B, and C). Apparently, in this situation, the nerve fibers also finally disappear and hyaline balls alone remain in the tissues. Both stages of this peculiar type of nerve-fiber degeneration (that is (a) the bodies within the nerve fibers, and (b) the free hyaline bodies after degeneration of these nerve fibers were often seen in clinically normal eyes of aged patients.

* It is interesting to observe that two of the nerve-fiber stumps in Figure 6 point in one direction (toward the optic disc) while the third one points exactly opposite. This peculiar fact is another evidence for the existence of centrifugal nerve fibers in the nerve-fiber layer of the human retina (Wolter and Liss,[8] Wolter[9, 10]).

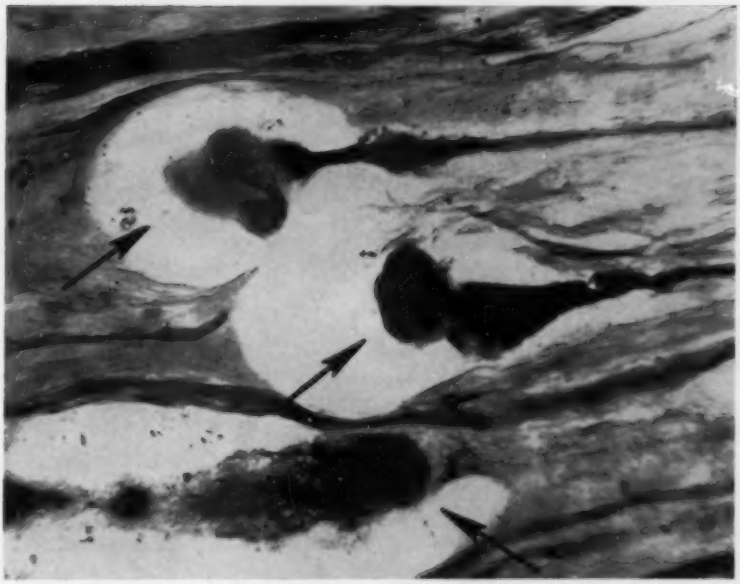

Fig. 6 (Wolter and Liss). Terminal bulblike swellings of interrupted nerve fibers (arrows) of the nerve-fiber layer of the eye of a patient with diabetic retinopathy. (Horizontal section, Hortega method, photomicrograph, ×800.)

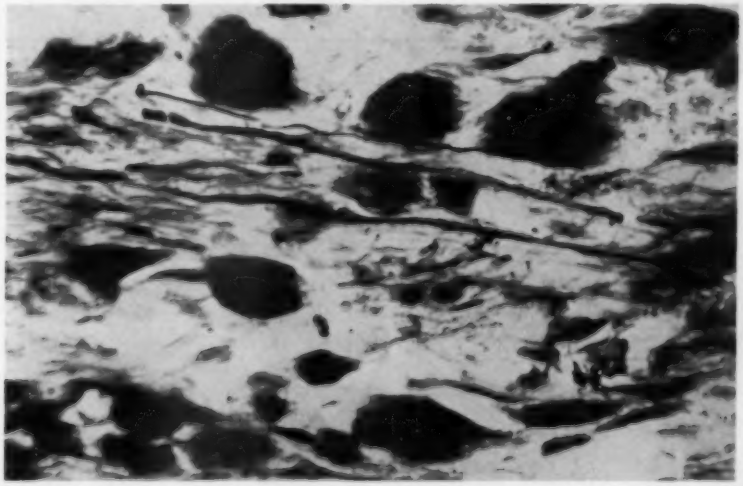

Fig. 7 (Wolter and Liss). Lipoid bodies among some continuous nerve fibers of the nerve-fiber layer of an eye with diabetic retinopathy. (Horizontal section, Hortega method, photomicrograph, ×600.)

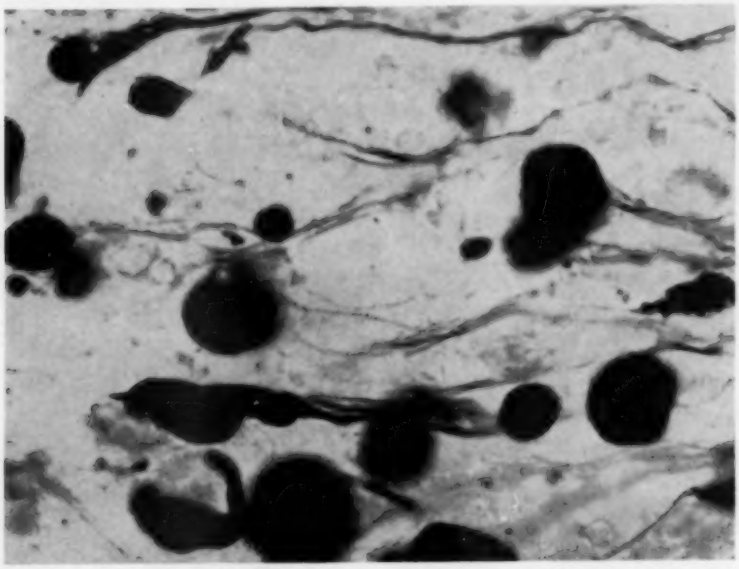

Fig. 8 (Wolter and Liss). Partly hyalinized lipoid bodies of the nerve-fiber layer of an eye with old retinal detachment. (Horizontal section, Hortega method, photomicrograph, ×600.)

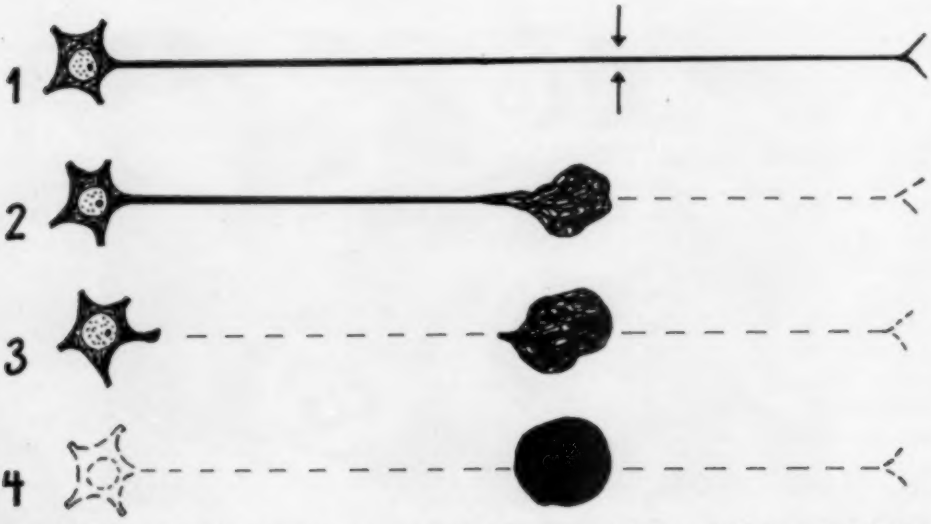

Fig. 9 (Wolter and Liss). Schematic drawing which demonstrates the stages of development of hyaline bodies from damaged nerve fibers of the human optic nerve as observed in the present case.

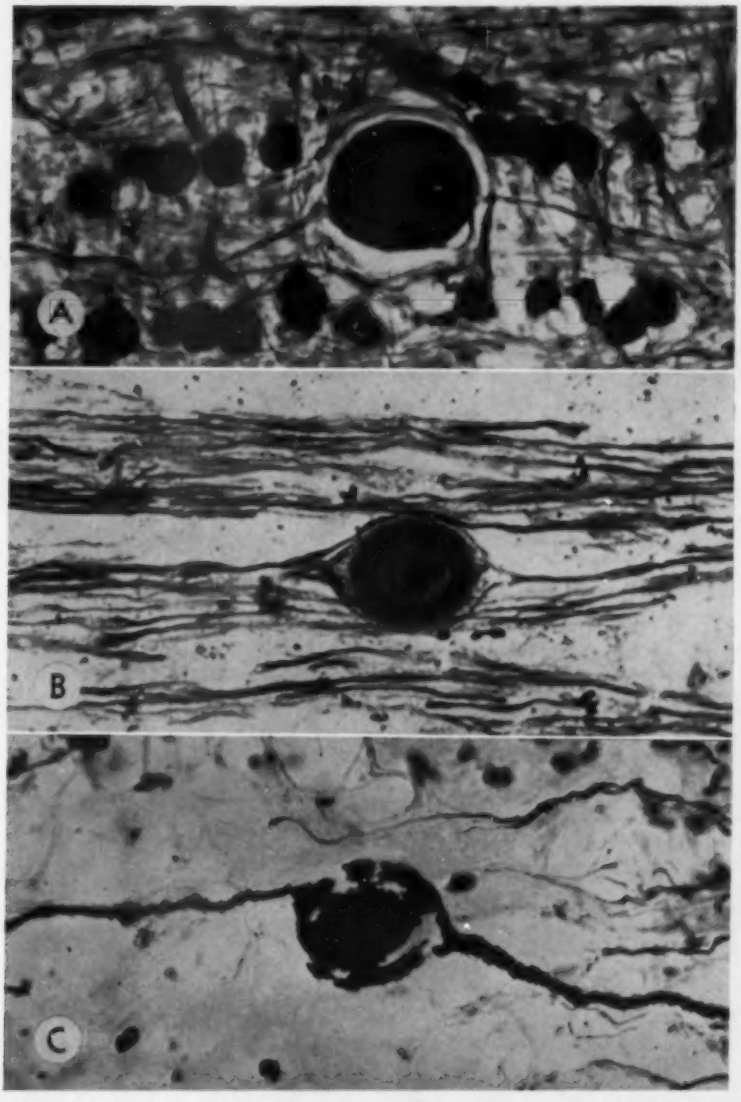

Fig. 10 (Wolter and Liss). Typical hyaline bodies within continuous nerve fibers of clinically normal eyes of aged persons. (A) In the optic nerve. (B and C) In the nerve-fiber layer of the retina. (Horizontal sections, Hortega method, photomicrographs, ×500.)

Comment

This study can be considered as only the first step toward an understanding of the nature and significance of the hyaline bodies of the human optic nerve and retina. The histologic findings in the present case of primary optic nerve atrophy indicate that hyaline ("cytoid") bodies in the human optic nerve, as well as in the nerve-fiber layer of the retina, may develop from terminal swellings of stumps of nerve fibers in the process of retrograde degeneration. These bodies virtually are the hyalinized remnants of such terminal swellings. However, the findings do *not* at all mean that hyaline bodies of the optic nerve *always* represent the end-result of such nerve-fiber degeneration. There actually is evidence from other cases that degeneration of astrocytes in the optic nerve and retina may also result in the formation of similar hyaline corpuscles (Wolter[4,5]).

There evidently is a special type of development of hyaline bodies within nerve fibers of the optic nerve and the nerve-fiber layer of the retina of normal eyes of aged persons.

Summary

All stages of the development of hyaline (cytoid) bodies of the optic nerve from terminal swellings of stumps of interrupted nerve fibers were observed in a case of primary optic-nerve atrophy following intracranial compression of the optic nerve by a meningioma. The same type of development of hyaline bodies has been observed under different pathologic conditions in the nerve-fiber layer of the human retina. There is a special type of hyaline bodies which develops within continuous nerve fibers of the optic nerve and the retina of normal eyes of old people.

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HEXOKINASE IN X-RAY CATARACT IN RABBITS*

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The first clinical signs of X-ray cataract appear weeks or months after irradiation of the rabbit eye (Poppe, 1942; Cogan and Donaldson, 1951). The metabolic changes which occur during irradiation and in the following weeks are largely unknown, although inhibition of mitosis in the epithelium of the lens occurs within half an hour of irradiation (von Sallmann, 1952), and two weeks afterward the desoxyribonucleic acid of the lens epithelium, judged histologically, is reduced in amount (von Sallmann, 1952). The only changes that have been reported to take place in the irradiated lens before clinical signs of cataract become visible are a loss of glutathione (Pirie, van Heyningen, and Boag, 1953), and of enzymes synthesizing glutathione (Daisley, 1955; see also Daisley [unpublished] in Pirie and van Heyningen, 1956), though many enzymes become progressively less active later in the course of cataract development (Pirie, van Heyningen, and Boag, 1953; van Heyningen, Pirie, and Boag, 1954).

Nordmann and Mandel (1955), and Mandel and Schmitt (1956), however, have recently compared the hexokinase activity of the normal and X-irradiated lens of the rabbit and report that irradiation brings about a great loss of hexokinase activity within two to four days after irradiation. (In six out of seven experiments more than two thirds of the activity was lost.) Clinical changes were observed in the lens about 35 to 50 days after irradiation. In rabbits killed more than 100 days after irradiation the hexokinase was still very much diminished in the affected lens.

Since these findings are at variance with unpublished experiments done by us in 1953 (Pirie and van Heyningen, 1956), in which we found no change in the hexokinase activity of the irradiated rabbit lens until opacity was almost complete, we have repeated our experiments and have tried to examine the reasons for the discrepancy between our results and those of the Strasbourg workers.

The rate of glucose use in the normal lens appears to be limited by the activity of the hexokinase present, since addition of hexokinase to a lens dispersion increases the rate of glycolysis. Similarly glycolysis by lens tissue is faster if hexose monophosphate, or hexosediphosphate is used as substrate than if glucose is used (Weekers and Süllmann, 1938; Green, Bocher, and Leopold, 1955). Hexokinase can therefore be considered as a pacemaker enzyme in lens metabolism and any change in activity in pathologic states, such as after irradiation, would have a marked effect on the overall metabolism.

Our experiments were similar to those of Nordmann and Mandel in that one eye of a rabbit was irradiated with a dose of X rays of 1,400 r, and the hexokinase activity was compared in the two lenses at various intervals thereafter. The important difference between the experimental technique used by Nordmann and Mandel and that used in the experiments reported here lies in the method of estimation of hexokinase.

Nordmann and Mandel (1955) incubated extracts of acetone-dried lens tissue, with the addition of fluoride, glucose, and ATP,* and measured the production of acid by the evolution of CO_2 from bicarbonate. We consider that this method has the disadvantage that it is not specific for hexokinase. The initial phosphorylation of glucose by hexo-

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* ATP, adenosine triphosphate; ADP, adenosine diphosphate.

kinase results in the formation of hexose monophosphate with the liberation of one equivalent of acid.

$$\text{glucose} + \text{ATP} \rightarrow \text{hexose monophosphate} + \text{ADP} + \text{H}^+ \quad (1)$$

Hexose monophosphate, however, is phosphorylated by the enzyme phosphohexokinase to give hexose diphosphate, with the liberation of a further equivalent of acid, and it seems likely that this reaction, and possibly other acid-producing reactions as well, took place in the experiments of Nordmann and Mandel.

$$\text{hexose monophosphate} + \text{ATP} \rightarrow \text{hexose diphosphate} + \text{ADP} + \text{H}^+ \quad (2)$$

A further limitation to their method is the fact that the evolution of CO_2 is liable to be diminished by retention due to the buffering action of the high concentration of lens protein present in the manometer vessel (Dixon, 1951; Umbreit, Burris, and Stauffer, 1949). This point becomes of particular importance in the measurement of hexokinase in the lens owing to the low activity of the enzyme with consequent small output of gas.

The method used in the work reported here is based on measurement of the disappearance of reducing sugar (glucose) and, under the conditions used, this occurs only as the result of hexokinase action. We believe this technique, therefore, to be the more reliable.

Since we did our original experiments, it has been found that hexose monophosphate, the product of the action of hexokinase on glucose (equation 1), is an inhibitor of the enzyme (Crane and Sols, 1953) and, unless removed, will cause a slowing of hexokinase activity. In the glycolytic cycle of glucose breakdown, hexose monophosphate is converted to hexose diphosphate by means of the enzyme phosphohexokinase (equation 2).

If this enzyme is present in excess of hexokinase it will remove the hexose monophosphate as fast as it is formed and no inhibition will be observed. In the rabbit lens phosphohexokinase is twice as active as hexokinase (Green, Bocher, and Leopold, 1955) and it seems therefore unlikely that our experiments are invalidated by accumulation of hexose monophosphate. However, to be on the safe side, we did a further series of experiments in which purified phosphohexokinase was added to the reaction mixture to ensure complete removal of hexose monophosphate. In this series of experiments we used rabbits of from six to eight weeks of age and killed them two to seven days after irradiation, whereas in the earlier series the animals had been irradiated when 17 to 23 weeks old and were not killed until the appearance of partial or complete cataract.

Nordmann and Mandel (1955) combined three lenses for each hexokinase estimation. For unstated reasons they used the cortex of the lens only, thus introducing a serious source of error, since it is impossible to remove strictly equivalent amounts of lens material from the two lenses of an animal. We used a dispersion of a single complete lens for each estimation to ensure that the irradiated lens and its normal fellow were strictly comparable.

Nordmann and Mandel treated their lens suspensions with acetone at $-10°C$. to inactivate phosphatases which break down ATP; we did not use this procedure but found that phosphatases did not have any appreciable effect on the level of ATP in our experiments.

Green et al. (1955) could find no phosphatases which split ATP in the rabbit lens and we have never found that lens tissue releases inorganic phosphate from ATP at an appreciable speed.

Methods

Production of cataract by irradiation

The right eye of a Dutch rabbit was irradiated by a single dose of X rays of 1,400 r, using a technique described previously (Pirie, van Heyningen, and Boag, 1953).

The left eye served as the control. Rabbits were killed at various intervals after irradiation, and a comparison was made of hexokinase activity of the normal and irradiated lens. Two series of experiments were done. In the first series the right eye of rabbits, 17 to 23 weeks old, were irradiated and the animals were killed 17 to 37 weeks later, when the irradiated lens was partially or completely opaque. In the second series the rabbits were six to eight weeks old when irradiated and were killed two to seven days later.

Measurement of hexokinase activity

First series (eight to 12 month old rabbits). A modification of the method of Long (1952) was used. The rabbit was killed by an injection of Nembutal, and the lenses from the two eyes were rapidly removed and weighed. Each lens was ground with a little sand and, for every x gm. lens, x ml. of solution at pH 7.8 containing potassium fluoride (0.15 M) and phosphate buffer pH 7.8 (0.12 M) was used. After grinding with fluoride x ml. of a solution, also at pH 7.8, and containing the following constituents, was then added: magnesium chloride (0.015 M), potassium chloride (0.125 M), glucose (1.0 mg./ml.), and adenosine triphosphate (10 mg./ml.).

The one in three lens suspension thus obtained was thoroughly mixed and two samples, each of 0.4 ml., were pipetted into two centrifuge tubes. One sample, T_0, was immediately deproteinized (Long, 1952) and kept aside for the estimation of glucose. The other sample, T_4, was stoppered and incubated in a water bath at 37°C. for four hours, after which time the reaction was stopped as before. Glucose was then estimated in T_0 and T_4. The decrease in the amount of glucose after incubation is attributable to the action of hexokinase (Long, 1952). In some experiments with normal lens, ATP was estimated at the end of the incubation period and found to be still at a high concentration, thus showing that the action of hexokinase was not inhibited by the destruction of ATP by phosphatases. Hexokinase activity has been expressed as μg. glucose used/hour/lens.

The amount of glucose originally present in the lens was deduced by subtracting the amount calculated to have been added to the sample T_0 from that actually found, and multiplying by the various dilution factors.

Second series (six- to eight-week-old rabbits). The hexokinase activity of the lens of these younger rabbits was found to be considerably higher than in the older rabbits of the first series. (This finding is in accord with the observations of Green, Solomon, and Leopold, 1956). It was therefore possible to use a greater dilution of lens in these experiments (one in nine) and to measure the glucose concentration initially, after 1.5 hours, and again after three hours' incubation at 37°C. Also, in this series, phosphohexokinase was added to the incubation mixture, as explained earlier.

Each lens was ground with sand and, for every x gm. lens, 5.0 x ml. of a solution at pH 7.8 containing potassium fluoride (0.09 M) and phosphate buffer (0.072 M) was used. Three x ml. of a solution, also at pH 7.8 and containing the following constituents, was then added: magnesium chloride (0.015 M), potassium chloride (0.125 M), ATP (20 mg./ml.), glucose (4.0 mg./ml.), and phosphohexokinase (0.2 mg./ml.). Three 0.4-ml. samples of this one in nine suspension were pipetted into centrifuge tubes and samples T_0, $T_{1.5}$, and T_3 obtained as before. The rate of decrease of glucose over the second 1.5 hour period was, within limits of experimental error, the same as that over the first 1.5 hour and an average of the two values was used to calculate the hexokinase activity of the lens.

The amount of phosphohexokinase used in the incubation mixture was at least five times the amount needed to remove the hexose monophosphate as fast as it was formed. A series of control tubes was included in each experiment, in which everything ex-

cept lens was added. These controls confirmed the absence of hexokinase from the phosphokinase preparation.

Glutathione. This was measured in the first series by the method of Grunert and Phillips (1951), using 0.1 ml. of the one in three lens suspension, deproteinized with 1.0 ml. two-percent metaphosphoric acid.

Glucose. This was measured in the deproteinized extracts by the method of Nelson (1944). The values for glucose obtained by this method are slightly too high, since ascorbic acid present in the lens extracts is also estimated as glucose. This does not affect the measurement of decrease in glucose concentration due to hexokinase activity, however, since the concentration of ascorbic acid does not itself alter during the period of incubation.

Materials

Adenosine triphosphate. The disodium salt, supplied by Sigma Chemical Company, Missouri, was used.

Phosphohexokinase. This was prepared by the method of Slater (1953). Residual hexokinase was inactivated by the following method (Long and Thomson, 1955): 1.0 ml. of the preparation was diluted one in two and incubated in a water bath at 56°C. for four minutes. After cooling, the heavy precipitate which formed was centrifuged down and discarded. The phosphohexokinase activity of the resultant extract was measured by the method of Long and Thomson (1955) and this method was also used to confirm the absence of hexokinase activity in the preparation.

Results

Table 1 gives the result of the first series of experiments. The irradiated lens showed no loss of hexokinase activity until it was almost opaque. Out of four lenses, almost or completely opaque, one showed negligible loss of hexokinase activity, two had lost about a quarter of the normal activity, and only one, which had been fully opaque for three months, had lost as much as three quarters of its hexokinase. The glutathione content of these lenses was drastically reduced and they had all increased considerably in weight. It is interesting that the glucose content of these lenses was found to be

TABLE 1

COMPARISON OF HEXOKINASE ACTIVITY, GLUCOSE CONTENT, AND GLUTATHIONE CONTENT OF NORMAL AND IRRADIATED LENS

First series. Rabbits 17 to 23 weeks of age at irradiation and killed 17 to 37 weeks later. Weight of normal (left) lens was 420 to 501 mg. and glutathione content was 1.06 to 1.45 mg./lens

Rabbit	Clinical State of R Lens at Death	Lens	Hexokinase Activity		Glucose		Lens Weight % Change in R Lens	Glutathione Content % Change in R Lens
			Decrease in Glucose µg/lens/hr.	% Change in R Lens	µg/lens	% Change in R Lens		
Non-irradiated	Normal	R	135	+2	253	−8	0	—
		L	133		234			
65	Slight cortical opacities	R	110	+7	225	−25	−4	−65
		L	102		302			
66	Widespread cortical opacities	R	69	+13	195	−17	+2	−58
		L	61		235			
67	Widespread cortical opacities	R	62	—	192	−28	−14	−61
		L	—		268			
68	Almost opaque	R	72	−22	303	+56	+18	−86
		L	79		194			
69	Opaque for 1 mo.	R	88	−26	434	+68	+27	−93
		L	119		259			
70	Opaque for 2 mo.	R	67	−8	417	+58	+22	−94
		L	73		259			
71	Opaque for 3 mo.	R	23	−72	421	+129	+19	—
		L	83		184			

significantly increased (table 1), thus confirming the diminished function of the hexokinase therein.

The glucose concentrations given in the table are too high, due to the presence of ascorbic acid, as explained in the Methods section. This means that the percentage increase in the glucose content of these lenses is actually higher than the figure given in the table, and any decrease in the ascorbic acid of the lenses would make the figure higher still. In fact, there does not appear to be any change in the ascorbic acid content of rabbit lenses made cataractous with X rays (Pirie et al., 1953).

Table 2 gives the results of the second series of experiments, in which the rabbits were younger and therefore more susceptible to lenticular damage by X rays (Cogan and Donaldson, 1951). In this series the measurements were made within seven days of irradiation, well before any clinical signs could be expected. Five pairs of lenses from unirradiated rabbits were included in the estimations and it was found that, with one exception, the difference in hexokinase activity between an irradiated lens and the control lens was no greater than the difference between a pair of normal lenses.

TABLE 2

COMPARISON OF HEXOKINASE ACTIVITY OF NORMAL AND IRRADIATED LENS

Second series. Rabbits six to eight weeks of age. Lens weight 154–225 mg. Pairs of lenses did not differ in weight by more than three percent

Rabbit	Days after Irradiation	Lens	Hexokinase Activity	
			Decrease in Glucose µg/lens/hr.	% Change in R Lens
Nonirradiated				
A	—	R	268	−9
		L	294	
B	—	R	254	−3
		L	261	
C	—	R	245	+4
		L	235	
D	—	R	246	+7
		L	231	
E	—	R	154	−3
		L	160	
R lens irradiated				
72	2	R	542	−1
		L	546	
73	2	R	245	−3
		L	252	
74	3	R	136	0
		L	136	
75	4	R	232	+9
		L	213	
76	7	R	202	−19
		L	248	
77	7	R	225	0
		L	225	

Discussion

Hexokinase, measured as described in this report, does not decrease in irradiated rabbit lens until an advanced stage of cataract development has been reached. These results conflict with those of Nordmann and Mandel (1955) who found a great decrease of hexokinase activity a few days after irradiation. This difference in results is probably due to difference in technique of measurement of hexokinase activity and we have already discussed the reasons for considering our technique to be the more specific method of measurement. The problem seems therefore to be one of deciding what reaction it is that is inhibited after irradiation and is measured by the technique of Nordmann and Mandel.

Summary

We have been unable to confirm the drastic reduction in the hexokinase activity of the rabbit lens brought about by irradiation with X rays, reported by Nordmann and Mandel (1955) and Mandel and Schmitt (1956). We have found no decrease in hexokinase until the lens was almost or completely opaque; at this time decrease in hexokinase activity was accompanied by a consequent rise in the concentration of glucose within the lens.

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MODIFICATION OF OUTFLOW FACILITY*

By variations in aqueous formation and ocular tension

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Experimental and clinical studies have demonstrated that the lowering of ocular tension by acetazoleamide (Diamox, Lederle) results from an impairment of aqueous formation which, with high dosage, attains about 50 percent.[4-7, 9, 14, 15, 20, 21] Our tonographic investigations in both normal and glaucomatous patients, before and after administration of Diamox, have confirmed this conclusion. The present study shows variations in outflow facility which apparently have not been previously noted.

I. Investigation of glaucomatous patients

A. Methods

Each tonographic test was of four minutes' extent. From calculations made from the tables of Friedenwald[1] the results were expressed in resistance to aqueous flow (R) and its inverse, the facility of outflow (C).

(Both R and C are given in discussing the results of tonography since European authors favor the former expression and American authors the latter. In an individual case, $R = 1/C$, but the arithmetical averages of R are not exactly the inverse of the arithmetical averages of C.

In this investigation the eyes studied included 38 with open-angle glaucoma and 15 with secondary glaucoma. Angle-closure glaucoma was rigorously excluded since such cases often exhibit rapid spontaneous variations in ocular tension and facility of outflow. Tonographic tests were made before and after administration of Diamox. A tablet of Diamox (250 mg.) was given at six, four and two hours before tonography. After an interval of one or more days each case was similarly retested and the average of the two tests was used for the record.

B. Results

The data of patients with open-angle glaucoma are individually listed in Table 1. The reduction of aqueous production (F) by Diamox was confirmed. In the high dosage used, the formation of aqueous was reduced by an average of 46.9 percent. The table reveals a slightly decreased resistance to flow (−4.68 percent) and a definitely increased facility of outflow (+13.29 percent).

The data of patients with secondary glaucoma are similarly listed in Table 2. Aqueous production was reduced 50.72 percent; the resistance to flow diminished (−9.21 percent), and the facility of outflow increased (+27.26 percent).

In Table 3 the cases of open-angle glaucoma in which the pretreatment tension was high (26 to 52 mm. Hg) are compared to those in which the pretreatment tension was relatively low (18 to 26 mm. Hg). In Group I, Diamox reduced production of aqueous 49.54 percent; resistance to flow decreased 14.21 percent; facility of outflow increased 23.20 percent. These changes are statistically significant. In the latter group the production of aqueous was reduced 44.38 percent, but the changes in resistance to and facility of outflow were negligible. The same deductions hold whether the calculations are according to the 1954 or the 1955 tables of Friedenwald (table 4).

In Table 5 a like comparison is made with cases of secondary glaucoma. In Group 1 the original tensions were 44 to 63 mm. Hg. In this group Diamox reduced the production of aqueous 43.63 percent; the resistance

* From the Department of Ophthalmology, University of Liège, Prof. R. Weekers, director. This investigation was aided by a grant from the Fonds National belge de la Recherche Scientifique. The abbreviations used were adopted at the Symposium on Glaucoma, Quebec, 1954 (Published by Blackwell, London). The manuscript, submitted in French, was translated for The Journal by James E. Lebensohn, M.D., Chicago, Illinois.

TABLE 1

EFFECT OF DIAMOX (250 MG., ×3) ON INTRAOCULAR PRESSURE (Po), PRESSURE OF FLOW (Pa), RESISTANCE TO FLOW (R), FACILITY OF OUTFLOW (C) AND AQUEOUS PRODUCTION (F) IN 38 CASES OF OPEN-ANGLE GLAUCOMA. THE INDICIAL NUMBERS INDICATE VALUES BEFORE ADMINISTRATION OF DIAMOX (N_1) AND DURING ITS ACTION (N_2). THE FORMULA, $\Delta\%\ Pa = \frac{Po_1 - Po_2}{Po_1 - 10} \times 100$, ASSUMED 10 MM. HG AS THE VALUE OF THE EPISCLERAL VENOUS PRESSURE (Pv)

Eye	Po_1	Po_2	% ΔPa	R_1	R_2	% ΔR	C_1	C_2	% ΔC	% ΔF
1	51.88	30.04	−51.68	10.33	8.57	−17.03	0.096	0.117	+21.87	−41.89
2	41.60	16.26	−80.18	10.24	6.53	−36.23	0.098	0.153	+56.12	−69.15
3	41.11	28.41	−40.82	13.10	7.98	−39.08	0.076	0.125	+64.47	− 2.95
4	36.21	18.42	−67.27	8.43	6.07	−28.00	0.119	0.165	+38.65	−55.62
5	35.65	25.43	−39.84	13.74	8.40	−38.86	0.073	0.119	+63.01	− 1.60
6	31.76	15.91	−72.84	9.75	6.18	−36.61	0.103	0.162	+57.28	−57.39
7	30.08	16.42	−68.04	4.80	6.65	+38.54	0.208	0.150	−27.88	−77.03
8	29.88	18.05	−59.51	9.19	10.71	−16.54	0.109	0.093	+14.67	−65.27
9	29.49	16.66	−65.82	7.15	7.89	+13.50	0.140	0.127	− 9.28	−69.10
10	28.66	14.31	−76.90	6.59	4.30	−34.74	0.152	0.233	+53.28	−64.66
11	28.56	16.29	−66.11	16.50	13.62	−17.45	0.061	0.076	+24.59	−58.92
12	28.10	15.62	−68.95	14.17	13.20	− 6.84	0.070	0.073	+ 4.28	−66.92
13	28.03	20.01	−44.48	5.07	4.81	− 5.13	0.197	0.208	+ 5.58	−41.41
14	27.83	15.33	−70.10	9.84	6.20	−36.99	0.102	0.161	+57.84	−52.49
15	27.68	20.96	−38.01	5.51	5.43	− 1.43	0.181	0.184	+ 1.65	−37.39
16	26.92	17.67	−54.67	5.69	6.97	+22.50	0.176	0.143	−18.75	−62.83
17	26.60	22.69	−23.55	3.83	3.36	−12.27	0.261	0.298	+14.17	−19.86
18	26.35	16.60	−59.63	8.40	7.26	−13.57	0.119	0.138	+15.96	−53.09
19	26.26	18.80	−45.87	3.90	3.75	− 3.84	0.256	0.267	+ 3.51	−43.75
20	25.43	20.15	−34.22	5.34	5.36	+ 0.37	0.187	0.187	0	−34.37
21	24.76	16.34	−57.04	4.37	4.16	− 4.80	0.229	0.240	+ 4.80	−54.89
22	24.60	13.82	−73.83	5.79	7.22	+24.69	0.173	0.139	−19.65	−78.96
23	24.16	13.48	−75.42	5.10	7.63	+49.60	0.196	0.131	−33.16	−81.22
24	23.60	16.60	−51.47	10.83	10.91	+ 0.74	0.092	0.092	0	−52.00
25	23.52	14.64	−65.83	9.43	7.83	−16.97	0.106	0.128	+20.75	−59.03
26	23.55	17.67	−43.39	7.56	5.14	−32.01	0.132	0.195	+47.72	−16.76
27	23.30	19.23	−30.60	4.44	4.31	− 2.93	0.225	0.232	+ 3.11	−28.66
28	23.12	18.42	−35.82	7.38	6.25	−15.31	0.136	0.160	+17.64	−24.72
29	22.36	16.60	−46.11	3.55	3.40	− 3.94	0.282	0.294	+ 4.25	−43.96
30	22.25	14.96	−59.51	3.70	6.64	+79.45	0.270	0.151	−44.07	−77.34
31	22.21	20.01	−18.02	6.34	9.06	+42.90	0.158	0.110	−30.37	−42.71
32	22.20	18.05	−34.02	7.15	5.75	−19.58	0.140	0.174	+24.28	−18.13
33	22.17	17.30	−40.01	6.67	4.82	−27.73	0.150	0.207	+38.00	−17.03
34	21.29	14.34	−61.55	14.22	8.31	−41.56	0.070	0.120	+71.42	−34.18
35	20.96	18.42	−23.17	7.29	8.92	+22.36	0.137	0.112	−18.24	−37.33
36	20.42	17.30	−29.94	5.95	5.11	−14.12	0.168	0.196	+16.66	−18.28
37	19.30	16.60	−29.03	6.56	7.66	+16.76	0.152	0.131	−13.81	−39.01
38	18.90	11.85	−79.21	4.55	6.11	+34.28	0.220	0.164	−25.45	−84.61
Mean:	27.11	17.57	*−52.18*	7.70	6.91	*− 4.68* (±4.4)	0.153	0.162	*+13.29* (±4.74)	*−46.96* (±3.45)

TABLE 2

EFFECT OF DIAMOX (250 MG., ×3) ON INTRAOCULAR PRESSURE (Po), PRESSURE OF FLOW (Pa) RESISTANCE TO FLOW (R), FACILITY OF OUTFLOW (C) AND AQUEOUS PRODUCTION (F) IN 15 CASES OF SECONDARY GLAUCOMA

Eye	Diagnosis	Po_1	Po_2	% ΔPa	R_1	R_2	% ΔR	C_1	C_2	% ΔC	% ΔF
1	Glaucoma capsulare	62.38	39.00	−44.63	19.54	14.95	−23.49	0.051	0.067	+ 31.37	−27.61
2	Thrombosis central vein	59.37	48.17	−22.68	13.53	19.03	+40.65	0.074	0.052	− 29.73	−45.20
3	Glaucoma posttraumatic	53.35	20.01	−76.91	11.77	6.04	−48.68	0.085	0.166	+ 95.29	−27.90
4	Glaucoma after lens extraction	52.22	24.90	−64.70	10.16	12.47	+22.73	0.098	0.080	− 18.37	−71.32
5	Thrombosis central vein	49.94	28.17	−69.53	19.00	8.40	−55.78	0.053	0.119	+124.53	−31.42
6	Glaucoma capsulare	48.17	22.11	−52.55	23.00	15.44	−32.87	0.043	0.065	+ 51.16	−29.52
7	Glaucoma postinfammatory	45.76	32.43	−37.27	7.98	5.36	−32.83	0.125	0.187	+ 49.60	−90.84
8	Glaucoma posttraumatic	44.69	30.94	−39.63	8.85	7.14	−19.32	0.113	0.140	+ 23.89	−25.25
9	Glaucoma postinflammatory	37.78	22.65	−54.46	13.32	8.27	−37.31	0.075	0.121	+ 61.33	−26.92
10	Glaucoma postinflammatory	32.20	15.97	−73.10	12.40	13.40	+ 8.06	0.081	0.075	− 7.40	−75.55
11	Glaucoma after lens extraction	31.80	18.05	−63.07	8.74	14.21	+62.58	0.114	0.070	− 38.59	−77.51
12	Glaucoma after lens extraction	28.49	19.84	−46.78	7.05	6.19	−12.19	0.142	0.162	+ 14.08	−39.69
13	Glaucoma postinflammatory	26.21	14.76	−70.63	10.06	8.20	−18.48	0.099	0.122	+ 23.23	−63.97
14	Glaucoma after lens extraction	23.85	13.50	−74.73	15.19	13.50	−11.12	0.066	0.074	+ 12.12	−71.43
15	Glaucoma after lens extraction	22.69	16.60	−47.99	7.14	8.56	+19.89	0.140	0.117	− 16.43	−56.74
Average:		41.26	24.47	*−55.91*	12.51	10.74	*− 9.21* (±8.66)	0.091	0.108	*+ 27.26* (±10.88)	*−50.72* (±5.48)

TABLE 3

EFFECT OF DIAMOX ON PRESSURE OF FLOW (Pa), RESISTANCE TO FLOW (R) FACILITY OF OUTFLOW (C) AND AQUEOUS PRODUCTION (F) IN 38 CASES OF OPEN-ANGLE GLAUCOMA, DIVIDED INTO TWO GROUPS ACCORDING TO THE INITIAL INTRAOCULAR PRESSURE (Po_1)

	Number of Cases	Po_1 Mean (mm. Hg)	% ΔPa	% ΔR	% ΔC	% ΔF
Group 1 from 26 to 52 mm. Hg	19	31.70	*−57.76*	*−14.21* (±4.76)	*+23.20* (±6.46)	*−49.54*
Group 2 from 18 to 26 mm. Hg	19	22.53	*−46.74*	*+4.85* (±6.76)	*+3.36* (±6.59)	*−44.38*

TABLE 4

COMPARISON OF THE EFFECT OF DIAMOX ON PRESSURE OF FLOW (Pa), RESISTANCE TO FLOW (R) AND AQUEOUS PRODUCTION (F) IN GROUP 1 OF TABLE 3 CALCULATED ACCORDING TO THE TONOGRAPHIC TABLES OF 1954 AND OF 1955 RESPECTIVELY

	Po_1	Po_2	% ΔPa	% ΔR	% ΔF
Table 1954	31.70	19.15	*−57.62*	*−14.21*	*−49.54*
Table 1955	30.70	19.04	*−55.63*	*−12.45*	*−45.70*

to flow decreased 18.69 percent and the facility of outflow increased 40.97 percent. In Group 2 the tensions were 22 to 38 mm. Hg. Diamox reduced aqueous production 58.83 percent but the changes in resistance to and facility of outflow were negligible.

In Table 6 the cases in Tables 3 and 5 are combined. In combined Group 1 the original tensions were 27 to 63 mm. Hg. Diamox reduced aqueous production 46.21 percent; the resistance to flow decreased 13.28 percent and the facility of outflow increased 29.01 percent. In combined Group 2 the original tensions were 18 to 27 mm. Hg. Diamox reduced aqueous production 46.72 percent, but the changes in resistance to and facility of outflow were inappreciable.

C. COMMENT

Tables 3 and 6 demonstrate that the reductions of aqueous production and ocular tension effected by Diamox are accompanied by a lessened resistance to flow and an increased facility of outflow, when the initial tension is high (group 1); but this does not occur when the initial tension is low (group 2). This difference would be missed unless the cases of high and low ocular tension were considered separately (tables 1 and 2). These tables show variations in facility of

TABLE 5

EFFECT OF DIAMOX ON PRESSURE OF FLOW (Pa), RESISTANCE TO FLOW (R), FACILITY OF OUTFLOW (C) AND AQUEOUS PRODUCTION (F) IN 15 CASES OF SECONDARY GLAUCOMA, DIVIDED INTO TWO GROUPS ACCORDING TO THE INITIAL INTRAOCULAR PRESSURE (Po_1)

	Number of Cases	Po_1 Mean (mm. Hg)	% ΔPa	% ΔR	% ΔC	% ΔF
Group 1 from 44 to 63 mm. Hg	8	51.98	−50.98	−18.69 (±12.01)	+40.97 (±19.60)	−43.63
Group 2 from 22 to 38 mm. Hg	7	29.00	−61.53	+ 1.63 (±12.30)	+11.60 (±12.18)	−58.83

TABLE 6

EFFECT OF DIAMOX ON PRESSURE OF FLOW (Pa), RESISTANCE TO FLOW (R), FACILITY OF OUTFLOW (C) AND AQUEOUS PRODUCTION (F) IN THE TOTAL CASES OF OPEN-ANGLE AND SECONDARY GLAUCOMA, DIVIDED INTO TWO GROUPS ACCORDING TO THE INITIAL INTRAOCULAR PRESSURE (Po_1)

	Number of Cases	Po_1 Mean (mm. Hg)	% ΔPa	% ΔR	% ΔC	% ΔF
Group 1 from 27 to 63 mm. Hg	27	38.60	−57.64	−13.28 (±5.47)	+29.01 (±7.64)	−46.21
Group 2 from 18 to 27 mm. Hg	26	23.35	−48.66	+2.90 (±5.34)	+3.76 (±5.07)	−46.72

outflow (C), but not in resistance to flow (R). The increased facility of outflow in Group 1 produced no change in the depth of the anterior chamber detectable by slit-lamp observation.

The lessened resistance to flow noted in Group 1 cannot be due to errors in the 1954 tonographic tables since the findings are confirmed with the 1955 figures[12] (table 4). That the reduction in aqueous formation induced by Diamox is of the same magnitude in both Groups 1 and 2 is further evidence of the validity of the calculations.

The variations in the facility of outflow can be explained by assuming that an impairment of excretion is effected by high intraocular pressure which is relieved as the intraocular pressure falls. The conditions of flow are not identical before and after the canal of Schlemm. The flow of aqueous after the canal is through more or less anastomosing conduits having a general radial direction. But before the canal the narrow trabecular spaces anastomose irregularly and offer a considerable resistance to the flow of aqueous which is likely to be enhanced by the squashing due to high intraocular pressure. Perfusion experiments were designed to test this hypothesis.

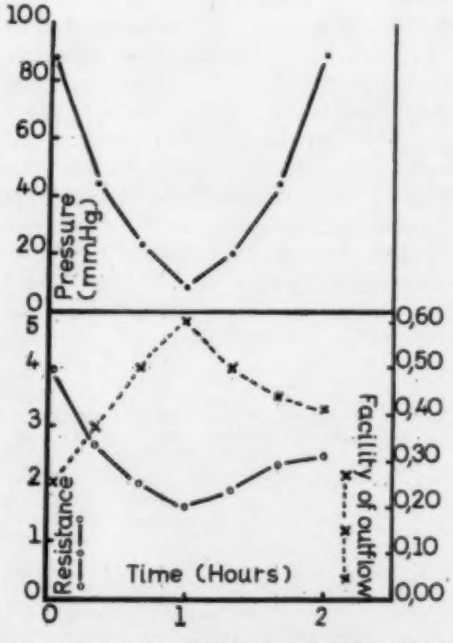
II. EXPERIMENTS ON THE ENUCLEATED EYES OF ANIMALS

A. METHODS

Freshly enucleated pigs' eyes were used for perfusion tests. The perfusion liquid had the following composition: NaCl, 0.7 percent (nine parts); buffered to pH 7.0 with M/15 K H_2PO_4 (four parts) and M/15 Na H_2PO_4 (six parts). The solution was introduced into the anterior chamber by a needle perforating the cornea and a manometer checked the induced intraocular pressure.

B. RESULTS

The facility of outflow diminished as the pressure of the perfusion liquid rose; and vice versa (graph 1). These effects did not



Graph 1 (Weekers, et al.). Variation of facility of outflow and of resistance as a function of the pressure of the perfusion liquid in the enucleated pig eye.

result from changes in the depth of the anterior chamber which, to biomicroscopic observation, were minimal and inconstant.

C. Comment

These experiments in enucleated pigs' eyes demonstrated that the facility of outflow is influenced by the pressure of the perfusion liquid. Marked ocular hypertension diminished the facility of outflow, that is, increased the resistance. Previous perfussion experiments on the eyes of cattle and horses produced the same result (graph 2).[20]

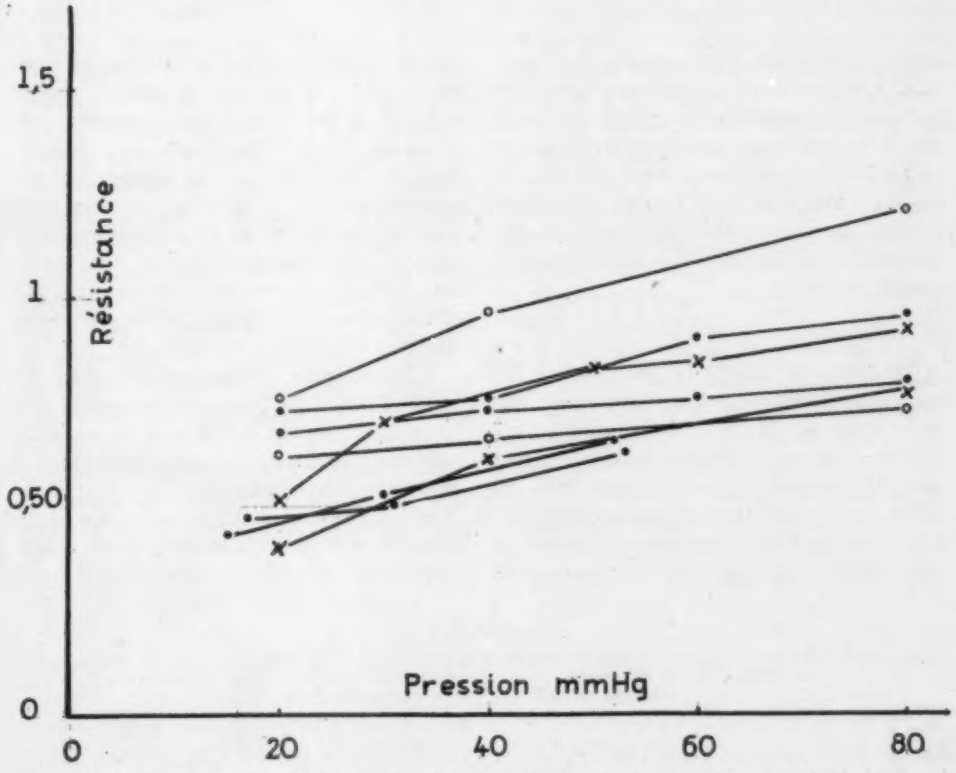
III. Experiments on normal human subjects

A. Methods

Tonographic tests were made on 24 normal eyes in patients ranging from 36 to 76 years of age, before and after administration of Diamox, 250 mg., six times during the preceding 24 hours. Those in which the ocular tension fell below 12 mm. Hg under the influence of Diamox were discarded, as the assumption made in the usual calculations of an episcleral venous pressure of 10 mm. Hg should have been controlled in a measure. This left 18 cases suitable for study.

B. Results

The effects of Diamox on aqueous production, resistance to flow, and facility of outflow (table 7) confirm again that the reduction in ocular tension induced by Diamox results primarily from suppression of



Graph 2 (Weekers, et al.). Variation of resistance to flow with the pressure of the perfusion fluid.
x —— x Eyes of horse. Perfusion with Ringer's solution.
o —— o Eyes of cattle. Perfusion with Ringer's solution.
• —— • Eyes of cattle. Perfusion with aqueous humor.

TABLE 7

EFFECT OF DIAMOX ON INTRAOCULAR PRESSURE (Po), PRESSURE OF FLOW (Pa), RESISTANCE TO FLOW (R) FACILITY OF OUTFLOW (C) AND AQUEOUS PRODUCTION (F) IN 18 NORMAL EYES

Eye	Po_1	Po_2	Δ% Pa	R_1	R_2	Δ% R	C_1	C_2	Δ% C	Δ% F
1	17.30	14.00	−45	2.90	2.90	0	0.344	0.344	0	−45
2	14.00	12.36	−41	5.11	5.21	+ 2	0.196	0.192	− 2	−42
3	18.00	13.50	−56	3.90	3.94	+ 1	0.256	0.254	− 1	−57
4	19.50	13.45	−64	4.16	4.00	− 4	0.240	0.250	+ 4	−62
5	15.91	15.00	−15	4.12	3.56	− 14	0.243	0.281	+16	− 2
6	19.60	18.00	−17	5.12	6.72	+ 31	0.195	0.149	−24	−36
7	18.80	18.00	−10	4.69	4.78	+ 2	0.213	0.209	− 2	−11
8	17.30	13.00	−59	4.38	5.70	+ 30	0.228	0.175	−23	−68
9	20.42	18.80	−16	5.03	5.85	+ 16	0.199	0.171	−14	−27
10	17.30	15.91	−19	6.02	4.51	− 25	0.166	0.222	+34	+9
11	15.91	12.36	−60	5.51	6.45	+ 17	0.181	0.155	−14	−66
12	22.17	19.61	−21	3.53	4.90	+ 38	0.283	0.204	−28	−43
13	21.30	16.61	−42	3.31	3.73	+ 12	0.302	0.268	−11	−48
14	18.80	12.36	−73	3.86	3.99	+ 3	0.259	0.251	− 3	−74
15	22.17	16.61	−46	2.95	4.44	+ 50	0.338	0.225	−34	−64
16	14.64	12.36	−49	6.20	7.26	+ 17	0.161	0.138	−14	−56
17	20.42	12.91	−72	2.30	5.17	+124	0.434	0.193	−56	−87
18	16.61	12.36	−64	4.74	5.21	+ 11	0.211	0.192	− 9	−68
Mean:	18.28	14.84	−43	4.32	4.90	*+17.21* (±7.5)	0.247	0.215	*−10* (±4.64)	*−47* (±6.1)

aqueous formation. This amounts to 47 percent, a figure identical to that obtained in glaucomatous subjects. In the normal individual the decreased tension is accompanied by an increased resistance to flow (+17.21 percent) and a reduced facility of outflow (−10.0 percent). The findings with the tonometric tables of 1955 are essentially similar (table 8).

C. COMMENT

The reduced facility of outflow that accompanies induced ocular hypotension results apparently from a modification of the outflow channels. Observations suggest that the phenomenon of homeostasis affects the physiologic regulation of ocular tension:[11]

1. The ligation of the common carotid in the rabbit effects primarily a lessening of aqueous production and a lowering of ocular tension. But the tension returns to normal before the local arterial pressure can be restored. From this observation Bárány[2] concluded that the fall in tension became compensated by an increased resistance to flow and confirmed this view by finding that, six days after the intervention, the resistance to flow as measured by perfusion of the enucleated eyes was higher in the eye on the operated side than in its fellow.[3]

2. Tonographic studies by Kornblueth and Linnér[10] in rabbit eyes demonstrated that the reduced tension due to aqueous suppression was partially compensated by increased resistance to aqueous flow.

3. Friedenwald and Linnér[12] showed by appearance time of fluorescein in the pupillary area that para-amino-hippuric acid

TABLE 8

COMPARISON OF THE EFFECT OF DIAMOX ON PRESSURE OF FLOW (Pa), RESISTANCE TO FLOW (R) AND AQUEOUS PRODUCTION (F) IN 18 NORMAL EYES CALCULATED ACCORDING TO THE TONOGRAPHIC TABLES OF 1954 AND OF 1955 RESPECTIVELY

	Po_1	Po_2	Δ% Pa	Δ% R	Δ% F
Table 1954	18.28	14.84	−43	+17.2	−47
Table 1955	18.40	14.76	−44	+21.4	−50

lessened the secretion of aqueous without, however, appreciably lowering ocular tension. This was explained by an accompanying increased resistance to aqueous flow.

4. Becker and Constant[8] in tonographic studies on rabbits demonstrated that the ocular hypotension resulting from impairment of aqueous production by Diamox was partially masked by increased resistance to aqueous flow. Confirming evidence was secured by the measurements of bicarbonate and ascorbic acid in the anterior and posterior chambers.

5. In the normal human the drop in ocular tension that follows a single dose of Diamox does not last as long as the period of lessened aqueous production. The more rapid restoration of normal ocular tension is partially due to a compensatory increase of resistance (Becker[6]).

6. In tonographic studies of normal eyes deRoetth[10] showed that an increased osmotic pressure of the blood effected a reduced production of aqueous and an increased resistance to flow. Conversely, a decrease in the osmotic pressure of the blood caused an increased production of aqueous and a lessened resistance to flow. These changes in resistance were not noted in glaucomatous eyes.

All these observations indicate that the ocular hypertension caused by decreased production of aqueous provokes a compensatory increase of resistance to flow. This occurs with Diamox, ligature of the common carotid, and injection of substances which lessen aqueous secretion. Our observations on normal eyes are analogous (tables 7 and 8).

IV. Clinical considerations

This study confirms the suppression of aqueous flow by Diamox and reveals the interaction between the level of intraocular pressure and resistance to flow. The clinical importance of these points justifies further comment:

1. *The suppression of aqueous production by Diamox.* Under the influence of Diamox the production of aqueous falls from 2.15 to 1.04 cu. mm. per minute in normal subjects; from 2.46 to 1.27 cu. mm. per minute in open-angle glaucoma; and from 2.64 to 1.49 cu. mm. per minute in secondary glaucoma—a reduction of approximately one half. Diamox, even in strong doses, never suppresses entirely the formation of aqueous. The persistance of a current, reduced to 1.0 to 1.5 cu. mm. per minute, accounts for the following clinical observations:

a. The aqueous veins are usually visible even when the hypotensive action of Diamox is most marked.

b. Continuous prolonged treatment with Diamox does not threaten the transparency of the crystalline lens. Experience with retrociliary diathermy has shown that a flow of 1.0 cu. mm. per minute is adequate for lenticular metabolism, though a complete suppression of aqueous formation rapidly provokes opacification.

c. Diamox alone does not normalize ocular tension unless the resistance to flow is very moderate. The flow necessary to maintain normal ocular tension can be calculated from the formula, $Po = (F \times R) + P v$. This requires data of the intraocular pressure, the resistance to flow, and the episcleral venous pressure.

2. *The interaction between intraocular pressure and resistance to flow.* The interaction between intraocular pressure and resistance to flow is manifested quite differently in ocular hypertension and in ocular hypotension. An elevated resistance increases the intraocular pressure and this in turn increases the resistance (tables 3, 4, 5, 6). On the other hand, ocular hypotension consecutive to a reduction of flow unleashes the reaction of homeostasis and causes a compensatory increase of resistance (tables 7 and 8).

The interaction between intraocular pressure and resistance to flow explains the following observations:

a. In an open-angle glaucoma in which

the tension is only moderately elevated epinephrine (two percent) lowers the ocular pressure by a reduction of the formation of aqueous without an accompanying change of resistance. This conclusion is supported by fluorometric and tonographic studies. But if the elevation of tension is marked the instillation of epinephrine causes also a diminution of resistance, as revealed by the tonographic measurements made before and after.[22,26] This is explained by the assumption of trabecular compression by high intraocular pressure followed by decompression when the ocular tension falls.

b. Retrociliary diathermy effects a reduction of ocular tension by a reduction of aqueous formation.[25] With a modification of technique[24] this intervention can cause an almost complete suppression of aqueous secretion causing a marked fall of tension even in eyes affected by absolute glaucoma. In some of these cases tonography revealed an increased facility of outflow, analogous to that noted after administration of Diamox (tables 3, 4, 5, 6) and after the instillation of two-percent epinephrine.

c. Goldmann[13] showed that compression of the globe accelerated the exit of aqueous and from this observation devised a method of measuring resistance to flow. But if the pressure on the globe is excessively strong, the flow of aqueous is suppressed. Kleinert[18] labelled this phenomenon, "maximum compensation." It appears to be an extreme case of the increased resistance provoked by very high intraocular pressure.

The effect of homeostasis in causing an increased resistance to flow when the ocular tension falls below the physiologic level because of reduced aqueous formation is not evident in glaucoma[10] (tables 3, 4, 5, 6). This may be interpreted as due to the following considerations: (a) Glaucomatous lesions of the excretory channels prevent homeostasis; (b) elevated resistance follows only hypotension, while in glaucoma the ocular tension is still higher than normal after Diamox (tables 3, 4, 5, 6) or after intravenous injection of hypertonic solutions;[10] (c) the diminution of resistance effected by trabecular decompression may mask the phenomenon of homeostasis.

The interplay of intraocular pressure resistance and flow complicates the interpretation of tonographic findings. The simplest situation occurs when the ocular tension is between 18 and 30 mm. Hg, since a tension of 30 mm. Hg is insufficient to cause any trabecular compression.

Summary

Tonographic studies of the effect of Diamox on the ocular tension of normal subjects and those with open-angle and secondary glaucoma reveal that intraocular pressure is determined by the interaction of diverse factors including the phenomenon of homeostasis. This interplay must be considered for a valid interpretation of tonographic findings. This research confirms that of previous authors in showing that Diamox in high dosage causes a reduction in aqueous formation of about 50 percent.

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OBSERVATIONS ON THE PATHOLOGY OF RETINAL DETACHMENT OPERATIONS ON HUMAN EYES*

PART II. SCLERAL RESECTIONS

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In a previous paper[1] observations were made on the pathology of diathermy reattachment operations performed on human eyes. In this paper, specimens of human eyes which have undergone scleral resection, both penetrating and lamellar, will be similarly studied.

PENETRATING SCLERAL RESECTIONS

The technique employed in the following cases was essentially that described by Pischel and Kronfeld.[2]

Figures 1 through 6 are from the eye of a 70-year-old man who underwent an extracapsular cataract extraction in December, 1950. Postoperatively a pupillary membrane was noted. In November, 1951, the patient began to lose vision. In February, 1952, a retinal detachment was discovered. The patient refused surgery until October 4, 1952, when a penetrating scleral resection over the inferior half of the globe was performed. The media remained hazy so that one could not tell whether the retina reattached postoperatively. On November 5, 1952, or 31 days postoperatively, the patient suddenly died. The eye was obtained at autopsy.

Figure 1 shows the puckered-in limbal wound and a band of tissue running from it to the lens remnant. This traction band contains lens capsule, lens cortex, vitreous, and connective tissue. From the lens remnant to the inferiorly detached retina runs a vitreous band which is barely visible (arrows) in Figure 2. Even the nonpigmented epithelium of the pars plana has been detached along with the retina (arrow, fig. 3).

Detachment of the pars ciliaris retinae is not frequently recorded.[3] It has been seen in eyes with malignant melanoma and in detachments following trauma.[4]

Figure 4 shows the appearance of the resection site. At this stage, one month postoperatively, the scleral wound is bridged by heavy episcleral reaction. The ends of the scleral wound are turned inward toward the vitreous cavity and a small wick of choroid is incarcerated in the wound.

Dellaporta[5] found in animal experiments that connective-tissue proliferation closing the scleral wound started mainly from the choroid with little participation by episcleral tissue. In Figure 4 healing of the scleral wound proceeds mainly from the episclera. In Figure 5, a high-power view of the inner portion of the scleral wound, there is very

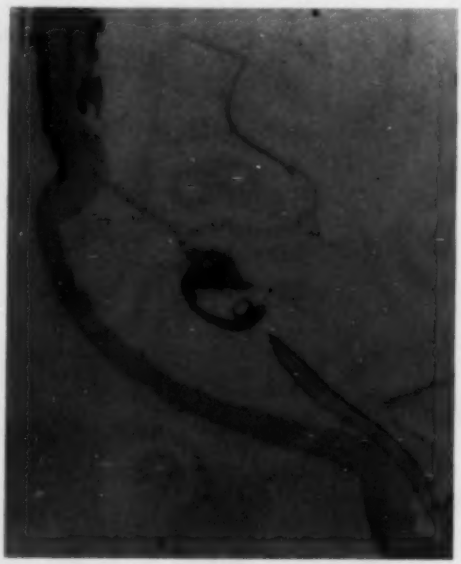

Fig. 1 (Tamler). Showing the puckered-in limbal wound and a band of tissue running from it to the lens remnant.

* From the Division of Ophthalmology, Department of Surgery, Stanford University Medical School.

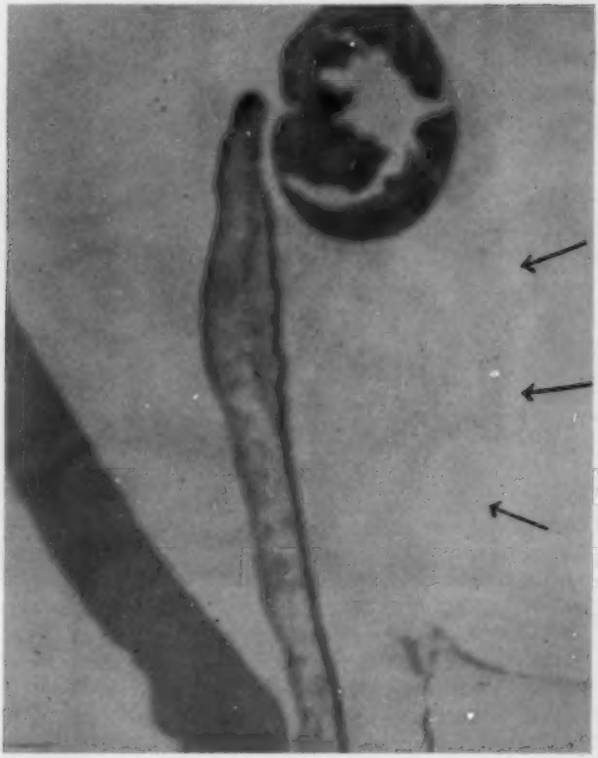

Fig. 2 (Tamler). A vitreous band which is barely visible (arrows) runs from the lens remnant to the inferiorly detached retina.

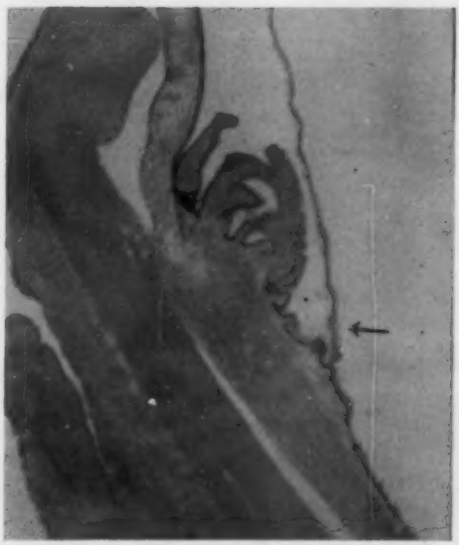

Fig. 3 (Tamler). The nonpigmented epithelium of the pars plana has been detached along the retina (arrow).

little contribution to the closure of the wound from either the choroid or sclera. The healing of the scleral wound from the episclera agrees with the observation of Weeker[6] in his work with experimental perforation of rabbit eyes.

Note the folding of the choroid over the

Fig. 4 (Tamler). Appearance of the resection site.

Fig. 5 (Tamler). Folding of choroid over the wound.

wound (fig. 5) in this relatively fresh specimen and compare this with the way the choroid adjusts to a smaller scleral coat in the next older specimen.

Figure 6 shows the granulomatous reaction in the region of the catgut sutures. Tissue necrosis was absent around the sutures. This is in accord with Dellaporta's experimental observation[8] that there is much less necrosis and degeneration around the sutures in a penetrating scleral resection than in a scleral folding or lamellar resection. In the latter procedure, according to Dellaporta, there is a tendency for the sclera to unfold causing the sutures to exert intense pressure upon the surrounding sclera. We shall see an example of this tissue damage in one of the lamellar resections reported later in this paper.

Now let us look at sections from an eye enucleated 14 months after a penetrating scleral resection. This eye came from a 35-year-old man who had a history of high myopia of approximately eight diopters in the right eye and 18 diopters in the left eye. In July, 1948, the patient noted poorer vision in the left eye and examination revealed a complete detachment of the retina

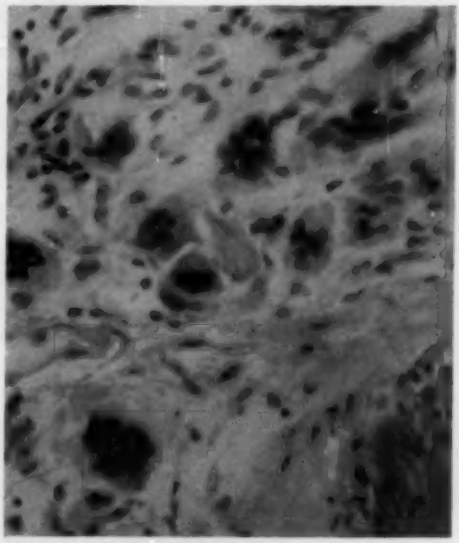

Fig. 6 (Tamler). The granulomatous reaction in the region of the catgut sutures.

with holes and a tear inferiorly. In August, 1948, a penetrating scleral resection supplemented by multiple diathermy was performed over the inferior nasal aspect of the globe. The operation was unsuccessful.

Examination in October, 1948, revealed a completely detached retina and visual acuity had dropped to counting fingers at one foot. In 1949, the patient suffered recurrent attacks of iridocyclitis. Posterior synechias and a cataract developed. The eye became red, irritable, and painful and was enucleated in October, 1949.

Grossly, there was dense scarring of the sclera inferiorly at the site of the resection, nine mm. posterior to the limbus. There was a cone-shaped detachment of the thickened and wrinkled retina except at a four-mm. area inferiorly in the region of the diathermy. There was a two-mm. retinal hole in this region. Diathermy scars penetrated the thickened sclera inferiorly and appeared as pale areas in several places about the inner surface of the choroid.

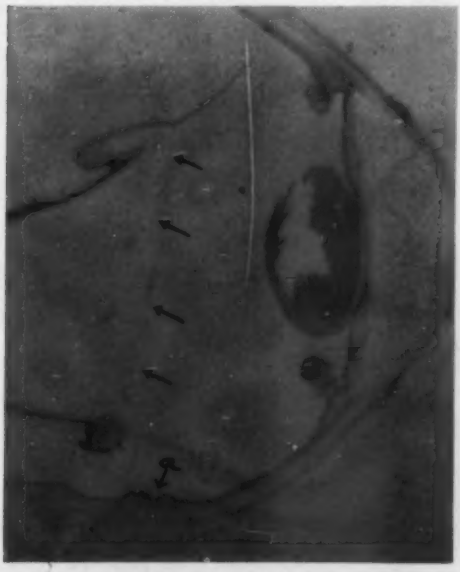

Fig. 7 (Tamler). The site of the resection (a) and a vitreous band (arrows) running from the superior to the inferior retina.

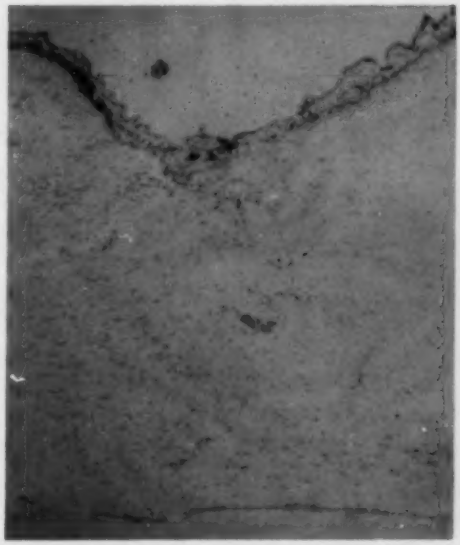

Fig. 8 (Tamler). Showing the scleral wound as a localized depression on the inner surface.

Figure 7 shows the site of the resection (a) and a vitreous band (arrows) running from the superior to the inferior retina. This traction band undoubtedly contributed to the failure of the operation by holding the retina off postoperatively. The band contained connective tissue, macrophages, inflammatory cells, and some glial cells. Wadsworth[7] has pointed out that vitreous strands containing cellular elements may exert considerable force in tugging on the retina.

Figure 8 shows the scleral wound as a localized depression on the inner surface. There is some scarring and atrophy of the overlying choroid. The episcleral reaction has disappeared completely. The choroid is not heaped up in folds directly over the wound as in the previous case. There was, rather, wrinkling of Bruch's membrane and the pigment epithelium (fig. 9) from the wound to the optic nerve, indicating that the choroid is loose enough to take up the slack of a scleral resection with time over a large area and not simply heap up in folds directly over the site of the operation.

In an eye removed six weeks after a

Fig. 9 (Tamler). Wrinkling of Bruch's membrane and the pigment epithelium from the wound to the optic nerve.

scleral resection Swan and co-workers[8] found the choroid thrown into folds on either side of the incision. They felt that the choroid had not contracted to fit the new and flatter curvature of the sclera. Perhaps with greater time the choroid would have adjusted itself to the shortened sclera.

Pischel and Kronfeld[2] indicate that usually the choroid slides along the sclera, thereby adapting itself to the new shape of the eyeball; this apparently happens in the typical case and accounts largely for the gradual ophthalmoscopic disappearance of the choroidal roll over the resection.

Dellaporta[5] found experimentally that in penetrating scleral resections the choroid developed folds along the excised scleral strip, compensating for its tissue surplus. These folds generally lasted two to four days in his experiments.

Lamellar scleral resections

The technique employed in the following cases was essentially similar to that described by Berliner.[9]

Figure 10 is included to show the gross

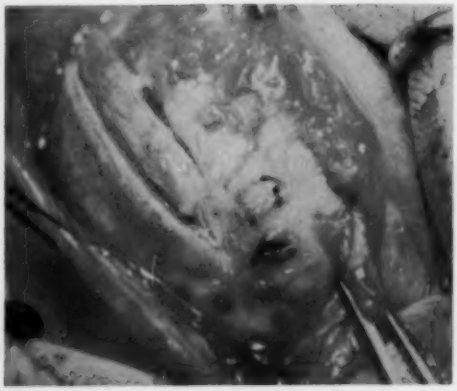

Fig. 10 (Tamler). The gross appearance of the site of a lamellar resection a few months after operation.

appearance of the site of a lamellar resection a few months postoperatively. The picture was taken at the time of a second lamellar resection. The new lamellar resection is seen at the left side of the picture. The old lamellar resection wound is scarcely visible and its site is marked by the black silk sutures. In the lower part of the figure old diathermy applications are present.

Figure 11 is a section from the left eye of an 81-year-old woman obtained 12 days after a lamellar scleral resection. In June, 1953, the patient noted some black spots at the

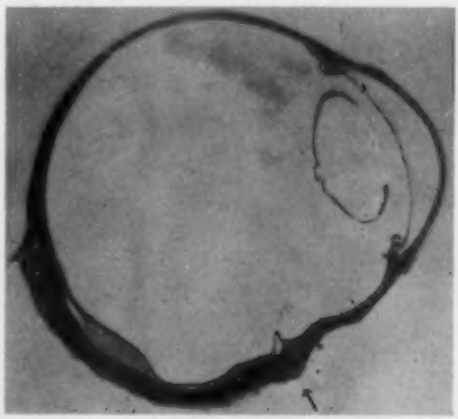

Fig. 11 (Tamler). Section from the left eye of an 81-year-old woman 12 days after lamellar scleral resection.

corner of her nose in her only, left, eye. These gradually became worse. The condition improved with bedrest but came back again when she got up. The eye had been treated for glaucoma for the previous two and one-half years.

On examination August 4, 1953, there was a detachment of the retina in the lower half. The detachment was raised in two big bullas with a cleft toward the 7:30-o'clock position. The macula was involved and vision was down to 10/200. The retina settled very slightly with bedrest.

On August 11, 1953, a lamellar scleral resection temporal and below was performed. A diathermy barrage was placed behind the resection and carried upward to the superior rectus and inferior and nasally to the medical rectus. Perforating pins were employed temporal and below. Fair drainage was obtained. A cyclodiathermy was performed at the same time. The last fundus examination two days before her death revealed considerable settling of the retina centrally. It appeared well attached nasal and below. It was still detached temporally and below in the area of resection. On August 23, 1953, 12 days after operation, the patient died suddenly of a myocardial infarction.

In Figure 11 the arrow points to the resection site. It has been said that retinal reattachment along the operated area occurs earlier in penetrating scleral resections than in lamellar resections.[5] This is borne out by the photograph in which the retina is thrown up in a fold protruding into the vitreous cavity although the adjoining retina has settled. The protruding retina probably would have settled, too, in time. Again, in this case healing of the wound proceeded from the episclera. Of course, in lamellar resections healing cannot come from the choroid since a thin scleral lamella intervenes.

A good deal of subretinal exudate is apparent in Figure 11 and also in the higher-power view of the wound in Figure 12. In the latter, the residual scleral lamella is buckled inward as expected, and there is

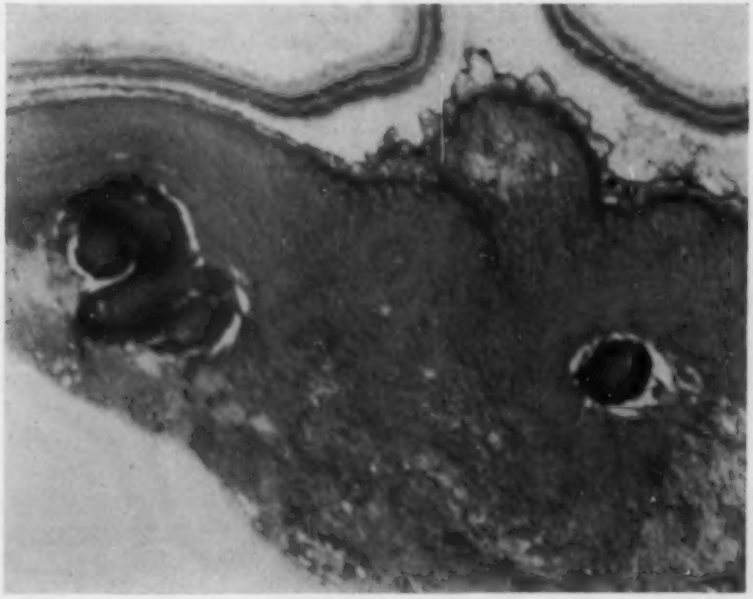

Fig. 12 (Tamler). High-power view of the wound from same case as in Figure 11.

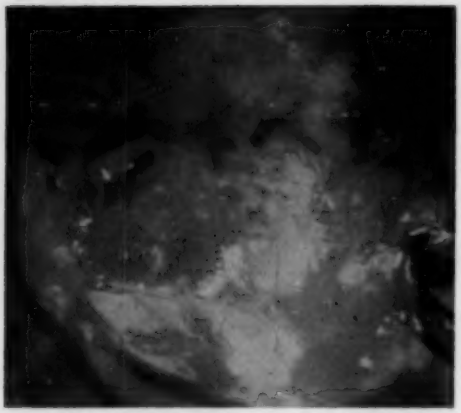

Fig. 13 (Tamler). Demonstrating a row of interrupted black-silk sutures from the first operation.

wrinkling of the choroid over the wound. The silk sutures are surrounded by areas of necrosis which, as mentioned before, goes along with Dellaporta's assertion of greater tension between sutures and sclera in lamellar resections.

The next report is that of a 63-year-old woman who, in August, 1954, noted blurring of vision with the right eye. She also noted that she saw better in the upper half of the right visual field than in the lower half.

Examination on September 27, 1954, revealed a large retinal detachment superiorly hanging down over the disc. Three holes were noted in the superior periphery. The detachment extended flatly below the horizontal on both sides to about the 4- and 8-o'clock positions.

On September 29, 1954, a lamellar scleral resection was performed over the upper half of the globe. The resection was about two-mm. wide and extended from the inferior edge of the lateral rectus to the inferior edge of the medial rectus. It was placed approximately 15 mm. behind the limbus. Diathermy was applied directly over the residual scleral lamella with a flat electrode, as well as behind the resection with a partially penetrating electrode. The retina appeared to flatten nicely by the end of the operation.

One month later the superior retina was reattached but an inferior detachment had now developed. A horseshoe retinal tear was present at approximately the 7:30-o'clock position in the periphery. A slightly elevated accumulation of pigment and exudate was noted along the course of the inferior nasal vein.

On November 10, 1954, a 1.5-mm. wide lamellar scleral resection was performed inferiorly extending between the edges of the previous resection. During the operation the slightly elevated pigmented fundus lesion was localized on the sclera. It did not transilluminate. The retina flattened nicely at the end of the operation. However, a large detachment recurred postoperatively. Because of the suspicious pigmented tumor, the surgical failures, and the fact that retinal holes can occasionally occur with malignant melanoma,[10] the eye was enucleated on December 9, 1954, approximately two and one-half months after the first resection and one month after the second resection.

Grossly, the episclera was thickened and matted to the globe. A row of interrupted black silk sutures from the first operation could be made out over the superior half of the globe from the 9- to 4-o'clock position about 13 mm. from the limbus (fig. 13). This wound was well healed two and one-half months after the procedure. The inferior scleral surface was obscured by matted connective and muscle tissue. There was an almost total retinal detachment with retinal tissue arranged in billowing longitudinal folds. Elevation and pigmentation of the choroid were seen along the line of scleral resection. A 4.0 by 4.0-mm relatively flat pigmented choroidal lesion was located at the 4-o'clock position just posterior to the equator.

Histologically the tumor turned out to be a choroidal nevus which widened the choroid to four times its normal size at the tumor site. Nasally, the retina was firmly

attached to and blended with the area of the first resection. Figures 14 and 15 are taken through this region of resection. Figure 14 shows the region of reattachment of the retina. The sclera is bowed inward. In both figures there is thickening of the sclera, loss of its normal orderly fiber arrangement, heavy episcleral reaction with vascularization, chronic inflammatory cell infiltration, and granulomatous formation in the region of the sutures. In Figure 15 note the extreme thinning and distortion of the choroid and retina by the application of diathermy directly onto the residual scleral lamella, employing a flat electrode. Figure 16 again shows the wrinkling of the choroid posterior to the resection to take up the slack created by a shortened sclera.

The presence of puckered fixed folds or star folds of the retina with a detachment has been recognized as a poor prognostic sign.[2, 11, 12] What holds the retinal folds together? They do not flatten out with bed-rest.[11] Yet since they may disappear after scleral resection[2] whatever causes the folds to adhere cannot be very strong.

In this unsuccessful case now under discussion, retinal folds were noted clinically with the ophthalmoscope before the second operation and also noted grossly in the pathologic specimen after the second procedure. Figure 17 is a section through such a puckered retinal fold. Under higher power (fig. 18) one can see that it is loose connective tissue on the inner retinal surface that holds the retinal folds together. For comparison an artefactual apposition of a retinal

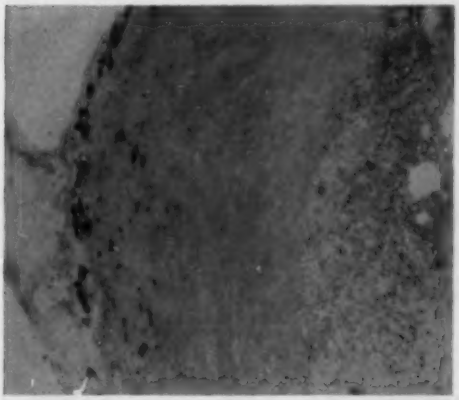

Fig. 14 (Tamler). The region of reattachment of the retina.

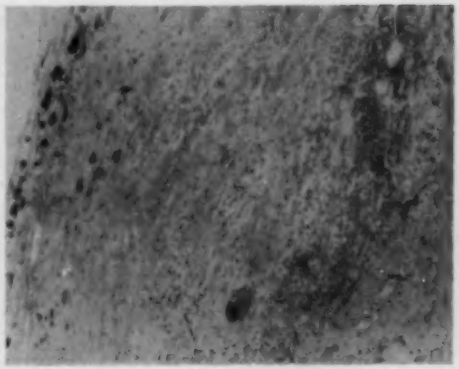

Fig. 15 (Tamler). Note the extreme thinning and distortion of the choroid and retina by the application of diathermy directly onto the residual scleral lamella.

Fig. 16 (Tamler). Wrinkling of the choroid posterior to the resection.

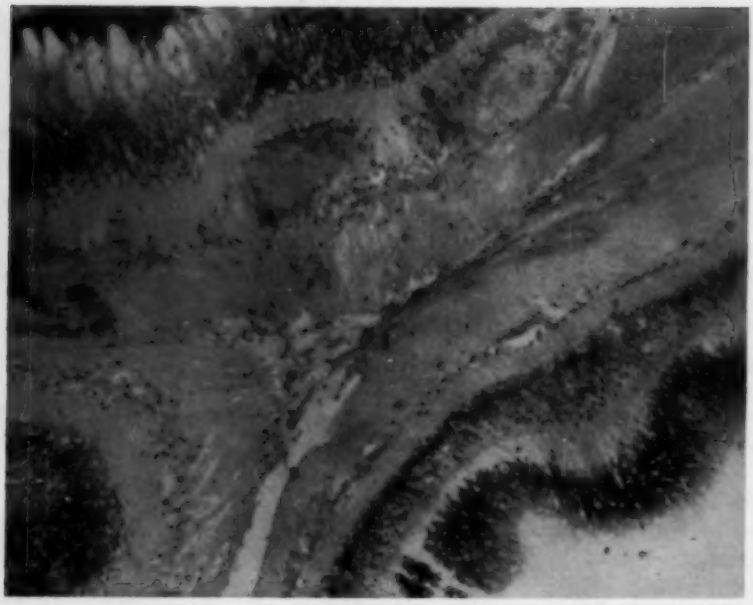

Fig. 17 (Tamler). Section through a puckered retinal fold.

fold from the same eye is include (fig. 19).

Weve[13] believes that the most frequent cause of recurrence after a temporary successful diathermy treatment is the local formation of a thin sheet or layer of connective tissue on the retina causing the so-

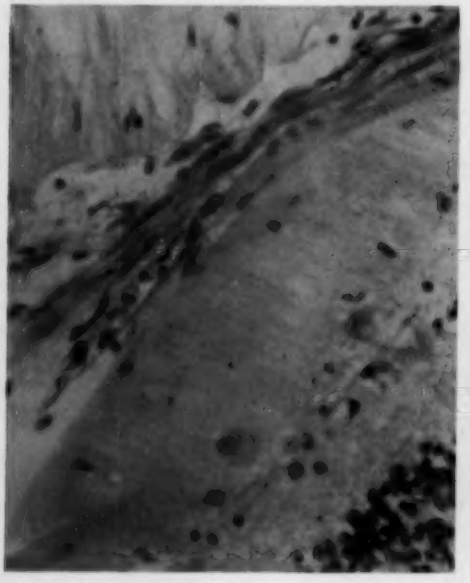

Fig. 18 (Tamler). High-power view of Figure 17.

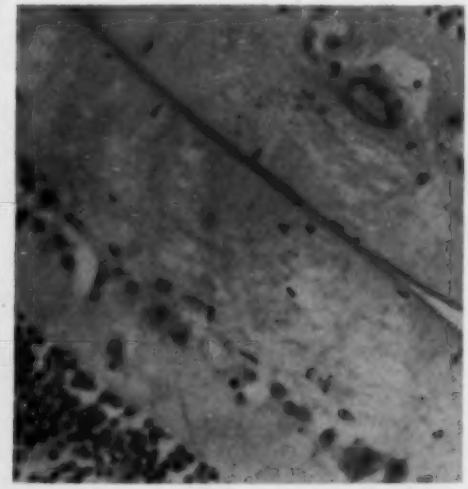

Fig. 19 (Tamler). An artefactual apposition of a retinal fold from the same eye as in Figures 17 and 18.

called star-shaped folds. He feels the connective tissue is derived from histiocytes distributed between the hyaloid membrane of the vitreous body and the retina.

Summary

Sections taken from human eyes which have undergone penetrating and lamellar scleral resections for retinal detachment are presented and discussed. Included in the discussion are observations regarding healing of the scleral wound, detachment of the pars ciliaris retinae, adjustment of the choroid to the shortened sclera, reaction around the sutures, effect of vitreous bands, settling of the retina, effect of diathermy directly on the residual scleral lamella, and the pathology of star-folds of the retina.

Clay and Webster Streets (15).

Acknowledgment

I am indebted to Dr. A. E. Maumenee and Dr. D. K. Pischel for their assistance in this study.

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Ophthalmic Miniature

I have seen many persons whose brains have become heated in the spring by the smell of red roses. They get a catarrh and a running of the nose. They also had an irritation of the eye-lids, which when the season passed subsided together with the catarrh and the nasal discharge. These people benefitted very little by treatment.

Baha-ul-Douleh, 1051,
Quintessence, chapter 9.

TREATMENT OF AMBLYOPIA EX ANOPSIA IN ADULTS*

A PRELIMINARY REPORT OF SEVEN CASES

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INTRODUCTION

The reduced visual acuity in amblyopic eyes presents a much more difficult therapeutic problem for the adult than for the child. It is generally thought that the possibility of improving the visual acuity in an amblyopic eye depends upon three factors: (1) The level of visual acuity attained before inhibition of vision began, (2) the length of time the vision had been inhibited, and (3) the age at which treatment to overcome the amblyopia was begun. Since adult amblyopia is of long standing and has not been treated at an early age (or treated without success), it is not generally accepted that amblyopia in adults resulting from a childhood squint responds successfully to treatment.

In an amblyopic eye, the decreased visual acuity and weakening of the power of central fixation occur concomitantly. Brock and Givner[1] recorded that only 20 percent of subjects with amblyopia fixate along the central foveal axis of the poor eye on occlusion of the good eye. The great majority of cases fix accentrically with the shift from the central position being greater the more profound the amblyopia.

Jones and Higgins,[2] investigating the acuity gradient within one degree of the central fovea, reported that the highest visual acuity was confined to a small region of seven minutes of arc. At 10 minutes from the fovea, there was a diminution of acuity. Thus any point of fixation farther away from the fovea than 10 minutes of arc would bring about a diminution of acuity, the level of acuity attainable decreasing the farther away the point of fixation is from the fovea. To realize the highest level of visual acuity, fixation must be established within a small region about the central fovea subtending seven minutes of arc.

When the young amblyope with reduced visual acuity of short duration is patched at an early age, improvement in acuity usually occurs spontaneously since the fovea, having the greatest potential for visual acuity, becomes the point of fixation. However, when central inhibition and the resulting eccentric fixation have been maintained for a long period of time, the chance of central fixation being learned spontaneously is lessened. In the long-standing amblyopic eye of the adult, central inhibition and eccentric fixation are usually well established. If the visual acuity is to be improved, patching of the good eye alone may not be successful. It is essential for these patients to acquire or to be taught central fixation before any significant improvement in visual acuity can occur.

The purpose of this paper was to determine whether an adult with an amblyopia resulting from a childhood squint could be taught to fix centrally with his poor eye, whether learning central fixation would enable the visual acuity to improve, and whether this increased acuity would be maintained after treatment was completed.

METHOD

Seven patients were chosen for this study solely on the basis of their individual motivation to undergo hospitalization for a four-week period. The purpose of this hospitalization as explained to them was to try to improve the vision in their poor eye. No other criteria were used to choose these patients.

Initially a routine eye examination re-

* Presented at the April, 1956, clinical meeting of the Wilmer Residents Association. This work was done at the 7505 United States Air Force Hospital (APO 232).

corded the age of onset of the squint, previous therapy, refractive error, and amount and direction of the deviation. The visual acuity of both eyes was tested with the A-O Projecto-Chart apparatus and recorded using a pinhole and with and without refractive correction. Of the seven patients, Case 1 (J. C.) had central fixation. The other six had eccentric fixation, that is, the amblyopic eye failed to direct its visual axis toward the target but took up the same deviated position in the effort to see it. Central field examination was performed on a Bjerrum screen at a distance of one meter. The Keeler Pantoscope was used for ophthalmoscopic examination (table 1).

After the examination, the good eye was padded. Pugh[3] has shown that foveal suppression in an amblyopic eye is affected inversely to the amount of stimulus applied to the good eye. To prevent this inhibitory effect, the light transmitted to the good eye often had to be reduced to 1/1,000 to 1/10,000 of that transmitted to the poor eye before the vision of the amblyopic eye returned to its monocular level. Thus one must distinguish between patching the good eye in which case the eye is often open beneath the patch and does receive light around or through the covering, and padding the good eye so that the eyelids are closed and there is no light stimulus.

Procedure

The patients in this series were padded as follows. The area about the good eye was washed with soap and water and dried. Tincture of benzoin was then applied to the skin about the eye. Using two eyepads and adhesive tape, a firm, light-proof covering was placed over the good eye so that it could not be opened beneath the padding. This padding was checked twice daily to insure complete occlusion of the good eye. Every four or five days, depending upon the condition of the padding, the covering was changed in a darkened room during which time both eyes were kept closed. With the commencement of padding, the patients were allowed to carry on with the hospital routine without any further instructions. After one week of padding, the visual acuity of the amblyopic eye was rechecked. Except for the first case, there was no significant improvement. This first case subsequently appeared to have a facultative amblyopia and quickly improved to 20/20 vision on patching only.

For the succeeding three weeks, the good eye was continuously padded. Excepting the first patient (who subsequently appeared to

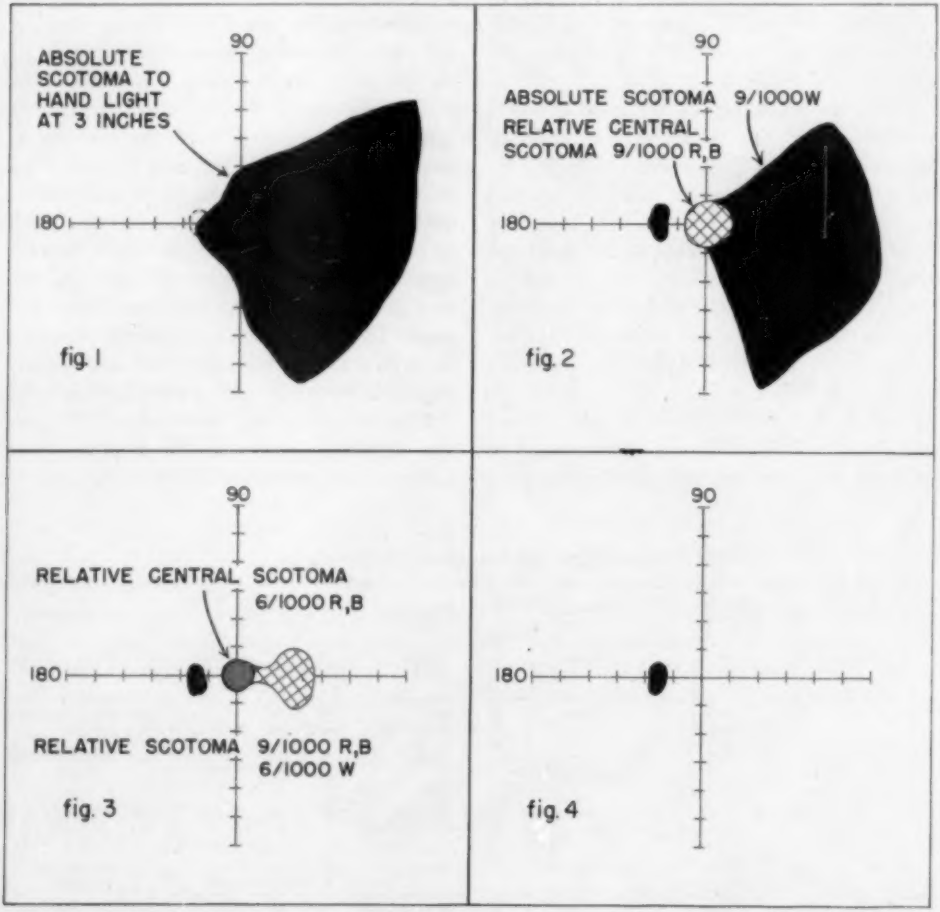
TABLE 1

Ophthalmic findings in subjects studied

No.	Name	Age	Age at Onset (yr.)	Previous Therapy	Refractive Error	Visual Acuity			Deviation
						s gl.	c p.h.	c gl.	
1	J. C.	19	6 following measles	None	None	R 20/70 L 20/20	20/100 20/20	— —	Right esotropia 7 p.d.
2	J. M.	18	3–4 esotropia R.E.	None	R −1.50 L −2.00 − .50×20	R 3/200 L 20/200	— 20/40	3/200 20/20	Right exotropia 12 p.d.
3	W. C.	18	4–5	Age 7—surgery O.U. and patching for 3 months	None	R 4/200 L 20/20	— 20/20	— —	Right esotropia 25 p.d.
4	T. A.	20	2–3	Age 10—glasses prescribed	R +5.25 −1.00×180 L +4.00 − .50×90	R 20/200 L 20/20	20/200 20/20	20/200 20/20	Right esotropia c gl. 20 p.d. s gl. 35 p.d.
5	R. T.	20	2–3 esotropia L.E.	Age 16—surgery L.E.	None	R 20/15 L HM in temporal field	20/15	—	Left exotropia 12 p.d.
6	R. L.	18	2–3	None	R +3.00 + .50×90 L +2.50 + .50×75	R 20/30 L 20/200	20/20 20/200	20/20 20/200	Left esotropia c gl. 4 p.d. s gl. 14 p.d.
	K. K.	22	4–5	Age 20—surgery O.U.	R +3.75 − .50×90 L plano	R HM L 20/20	— 20/20	— —	Right esotropia 30 p.d.

have a facultative amblyopia), the patients had eccentric fixation in the amblyopic eye as previously stated. With eccentric fixation, the visual acuity could never be improved above the level of potential acuity of the retina at the site of eccentric fixation; in the present series of cases, this level was no better than 20/200. Only by developing centric (true macula) fixation could the visual acuity be improved to a level above 20/200. Accordingly, the first problem was to teach the patients to fixate with the true macula of the amblyopic eye. This was accomplished in three steps:

1. Fixation on an ophthalmoscope light during simultaneous direct observation by the examiner. For this purpose, the optical disc of the pantoscope was set for macula examination and the diameter of the light beam controlled with the iris diaphragm. The patient was told in which direction to turn his eye for macula fixation and told when the light was centered on the macula. He then attempted to correlate firstly, the differ-



Figs. 1 to 4 (Kupfer). Progressive field examination of Case 5. (Fig. 1) Initial examination: vision, left eye, is hand movements in the temporal field, with eccentric fixation. (Fig. 2) One week later. The patient has learned central (macular) fixation. Vision in the left eye is 20/200. (Fig. 3) Two weeks later. Vision, left eye, is 20/40. (Fig. 4) Three weeks later. Vision, left eye, is 20/25.

ence in the brightness of light which he experienced when the light was directed straight through to the macula as compared to the sensation of brightness experienced when the light was thrown obliquely onto the peripheral retina and, secondly, to assess the direction and amount of movement which his eye had to make to fix the ophthalmoscope light; this the patient found difficult but made easier by the sensation of relative adduction or abduction of the padded eye.

2. After the patient was able to fixate a light with his macula, he wore a pinhole and studied the light held at distances up to five feet and large printed letters one to two feet away. The patients claimed that the pinhole enabled them to hold central fixation more easily, although in the cases of esotropia, the line of vision through the pinhole was in a position of relative abduction to the usual position of the eye.

3. The central field of the amblyopic eye was mapped periodically on the tangent screen. The relationship between the point of fixation, the blindspot, and any scotomas gave some indication of whether there was central fixation or not (figs. 1 to 4). During this period of learning macular fixation, the good eye was padded continuously.

Results (table 2)

Central fixation on a light was usually learned in four or five days although Case 7 took 10 days because he inadvertently developed paramacular fixation (fig. 5). This was somewhat difficult to remedy but was corrected by correcting the central field pattern. When the patients were able to hold macula fixation on a light target or letters held at close range, they still found much more difficulty in fixing a Snellen chart at 20 feet.

Cases 4, 5, and 6 attained visual acuity in the amblyopic eye of 20/30 and 20/25 after four weeks. Cases 2 and 3 were able to fixate a light with the macula but appeared unable to improve the vision in the amblyopic eye over the level attained after one week of macular fixation and patching, that is, 20/200. At first, Case 7 was unable to maintain macula fixation at distances greater

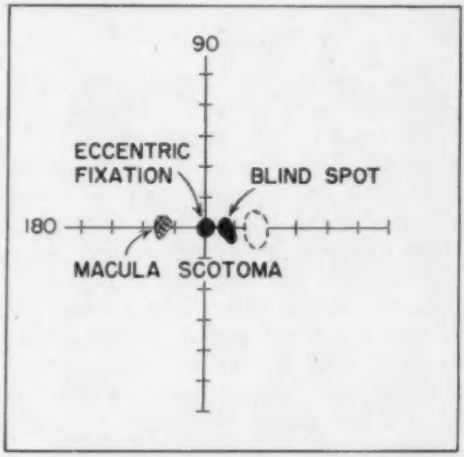


Fig. 5 (Kupfer). Case 7. Paramacular fixation.

TABLE 2

Results of treatment

No.	Patient	Initial Vision of Amblyopic Eye	Visual Acuity of Amblyopic Eye After					
			One Week	Two Weeks	Three Weeks	Four Weeks	Six Weeks	Twenty-four Weeks
1	J. C.	20/70	20/40	20/20	20/20	—	—	20/20
2	J. M.	3/200	5/200	20/200	20/200	20/200	—	20/200
3	W. C.	4/200	5/200	20/200	20/200	20/200	—	20/200
4	T. A.	20/200	20/200	20/40	20/40	20/30	—	20/30
5	R. T.	HM temporally	5/200	20/200	20/40	20/25	—	20/25
6	R. L.	20/200	20/200	20/40	20/40	20/30	—	20/30
7	K. K.	HM	3/200	15/200	20/200	20/200	20/40	20/40

than five feet for, although he was able to read 5/10, his best vision at 20 feet was 20/200. However, Case 7 was given an additional two weeks of hospitalization with intensive reading of small print. The visual acuity then improved to 20/40. Case 1 apparently had macula fixation from the beginning and proved to be a case of facultative amblyopia, quickly regaining vision on patching in a short period of time. In the cases showing improvement in visual acuity, this improvement was maintained when the patients were retested 24 weeks after discharge from the hospital. During this period of six months, the patching was discontinued. The patients returned to their respective bases and resumed their jobs. No further advice was given as to use of the eyes.

Discussion

From working with these patients, it appears that the individual's intelligence and motivation are of the utmost importance in regaining vision in an amblyopic eye. In all probability, further improvement of vision in Cases 2 and 3 would have occurred if more time was spent working with these patients. This was demonstrated in Case 7. However, the possibility of a macular pathologic condition (such as macular hemorrhage at birth) which is no longer apparent must be considered whenever an effort is made to improve the vision in the amblyopic patient.

Dr. Mary Pugh of the Institute of Ophthalmology, London, has worked with adult patients having an amblyopic eye resulting from a childhood squint and has been able to improve the visual acuity in many cases by long-term intermittent treatment over a period of three to four years. The present work has accelerated and intensified this process with the same result in a relatively short period of time.

Summary

Seven adult white male patients, aged 18 to 22 years, were chosen for this study solely on the basis of their individual motivation to undergo hospitalization for a four-week period. All these patients had an amblyopic eye resulting from a childhood squint. Using the simple techniques outlined above, one patient with an initial visual acuity of hand movements improved to 20/25, and another with hand movements improved to 20/40. Two patients with initial vision of 20/200 improved to 20/30. One facultative amblyope in the series improved from 20/70 to 20/20. The remaining two cases with 4/200 and 5/200 were unable to improve beyond the level of 20/200.

It appears absolutely essential that true macula fixation be established before improvement of visual acuity is possible in the amblyopic eye. With constant padding of the good eye and development of macula fixation in the poorer eye, the visual acuity should be improved to at least 20/40 in a relatively short period of time in hospital provided there is no macula pathology.

The Johns Hopkins Hospital (5).

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THE EFFECT OF TOBACCO ON THE NORMAL ANGIOSCOTOMA*

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Angioscotomas were first described[1] in 1926. They signify "defects of the visual field resulting from the blindspot of Mariotte and related in form and pattern to distribution of the retinal vessel tree." They were first thought to be shadows of retinal vessels but this view was modified because:

The degree of widening of an angioscotoma is often so great and rapid that a retinal vessel would burst were it to dilate with corresponding speed; the widened shadow may be six to 10 times larger than normal; when pressure is made upon the globe the retinal vessels narrow, while the angioscotoma widens; and in conditions known to cause vasodilation, the degree of widening of the angioscotoma is greater than the widening of corresponding vessels seen ophthalmoscopically.

The fact that an angioscotoma corresponds in form to the retinal vessel tree makes it seem likely that those structures and functions most intimately related to the vessel should receive first consideration. After extensive research these shadows have been interpreted as arising through modification of the retinal perivascular spaces[2] and in the retinal synaptic junctions.

Since the time of its introduction, angioscotometry has been used for clinical investigation in various diseases. It has also been used for studying the action of various therapeutic drugs and the effect of high altitudes on the visual field[3] during World War II.

It was only recently that Fink[4] showed an interest in the effect of smoking on the normal angioscotoma. As a result of his study he came to the following conclusions:

1. The smoking of a certain popular brand of cigarette (containing about two-percent nicotine) produces a widening of the angioscotoma.

2. Cigarettes containing one tenth the nicotine produce an alteration in the angioscotoma of lesser degree than that observed by the popular brand.

3. Inhalation of an unlighted cigarette produced no alteration of the angioscotoma.

Fink therefore attributed all these changes to the stimulation of the sympathetic nervous system by the nicotine in the tobacco, the degree of widening of angioscotoma being in direct proportion to the amount of nicotine in tobacco.

Since the use of tobacco in various ways is so widespread over all the world and the habit so common, it was thought that the knowledge of its effect on the eye might be of clinical interest and might throw some light on the early diagnosis of tobacco amblyopia. According to the graphic representations of Fink,[4] the degree of widening of the angioscotoma could also suggest the best form, the more harmless ways, and the safe limits of consuming tobacco.

In the present studies, the nicotine content of the tobacco in various commonly used cigarettes, and also in the main stream of its smoke, was estimated. After determining the amount of nicotine passing over with the smoke of a cigarette, changes in the angioscotoma were plotted. Later, varying quantities of tobacco containing different amounts of nicotine were given and variations on the angioscotoma with each were noted.

Material

The campimeter used for plotting the angioscotoma was made according to the details given by Evans.[5] Monocular fixation was employed. The patient was permitted to rest for about 10 minutes before the actual mapping was begun; during this

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time the patient was told various details of the procedure. The disappearance of the test object was indicated by tapping. The diameter of the test object used varied from 0.4 to 0.6 mm., a 0.5 mm. test object being used in most cases. The chart was illuminated by about 15 foot-candles.

The blindspot was first plotted, taking the object from the visible to the invisible area at right angles to the border of the defect. The main two superior and two inferior scotomas were plotted. The method was practiced many times before actually starting the work so that a satisfactory plotting could be made in a short time.

Procedure and Observations

A total number of 72 eyes were examined. All of the subjects were males, whose ages varied between 20 to 40 years; most of them were between 25 to 30 years. They were divided in various groups:

Ten normal persons were examined, three of whom were smokers (10 to 20 cigarettes per day), the rest were nonsmokers. None of them smoked for at least four hours before they were studied. Their angioscotomas were plotted, after which they were given a market-brand cigarette containing about two-percent nicotine in tobacco, which was smoked until two cm. were left. The angioscotoma was again plotted just after smoking and then every 15 minutes (fig. 1). It was noted that the angioscotoma widened, together with the blindspot; the maximum widening took place just after smoking, varying from three to eight degrees, after which it decreased to return to normal in 45 to 60 minutes.

Seven subjects were given an equal weight of cigar tobacco, containing about two-percent nicotine. After smoking, a similar change in the angioscotoma was noted which was neither quantitatively nor qualitatively different from that produced by the cigarette. It returned to normal in 45 to 60 minutes.

Next, an equal amount of pipe tobacco containing three-percent nicotine was given to five persons. The changes in angioscotoma after smoking were the same and lasted for an equal time as those produced by one market-brand cigarette.

Five subjects were given an equal weight of "bidi" tobacco containing four-percent nicotine. The angioscotometric changes were in no way different from those produced by one cigarette.

Ten subjects were given a "du-Maurier" filter-tipped cigarette, the smoke of which contains only 33 percent of the nicotine present in the smoke of a nonfilter-tipped cigarette, although the tobacco of both contain about two-percent nicotine. The widening of angioscotoma was almost the same in extent and intensity as with a normal cigarette and took the same time to return to normal.

Five subjects received half a cigarette, and changes in angioscotoma were plotted. The same subjects were given two cigarettes, one after the other. Changes in the angioscotoma in both instances were similar in intensity and duration as those produced by one cigarette. These observations show that the changes in the angioscotoma do not in any way de-

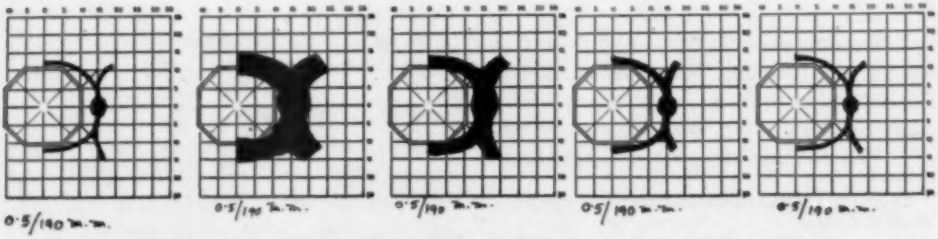

Fig. 1 (Mathur and Mathur). Effect of smoking one cigarette on a normal angioscotoma. The angioscotoma was plotted every 15 minutes.

pend on the amount of nicotine in tobacco or its smoke.

To find if tobacco alkaloids are at all responsible for these angioscotometric changes, cigarettes were rolled with tobacco from which the alkaloids had been removed. Tobacco was treated with a mixture of ether and petroleum ether for four days, with two to three changes every day. It was then washed with water several times and tested for the alkaloids by Mayer's reagent. When this did not give a precipitate, the tobacco was dried and mixed with a thick sugar solution, which helped in binding, and rolled into cigarettes, the weight of tobacco being equal to that of a market-brand cigarette.

Ten subjects were given such an alkaloid-free cigarette. The changes in the angioscotoma were similar to those with the market-brand cigarette containing nicotine. It was evident therefore, that alkaloids were not responsible for the changes in the angioscotoma.

During these investigations, a few subjects could not inhale the smoke and simply puffed it out of the mouth. In these subjects, the angioscotoma remained unchanged even after 45 minutes, showing that it was necessary for the smoke to be inhaled before any change in the angioscotoma was produced.

In the next group of 10 cases, the factor of smoke was eliminated by testing with chewing tobacco which was equivalent in terms of nicotine contained to the smoke of one cigarette. All these subjects were habituated to chewing tobacco but of a much lesser quantity at a time. No change in the angioscotoma could be detected, even after one hour. This further confirmed that the smoke as such was responsible for the changes in the angioscotoma and not the nicotine, which still went into the system during chewing.

Further, in 10 subjects, after plotting the normal angioscotoma, the throat was irritated with a swab stick. Surprisingly, in all of them the angioscotoma widened, of course lesser in amount and for a shorter duration. This suggests that the irritation of throat, probably by the smoke during smoking, is responsible for the angioscotometric changes and not the alkaloids contained in tobacco or its smoke.

Conclusions

The dilation of the angioscotoma due to tobacco smoking does not depend on habitual smoking nor even on the brand of tobacco, its nicotine content, or the nicotine in its smoke. These points have been made evident by the fact that the intensity and duration of dilation of the angioscotoma was the same when an equal weight of market-brand of cigarette, cigar, pipe, and bidi tobacco was given, containing two percent, two percent, three percent, and four percent nicotine, respectively. Further these changes were not different when a filter-tipped "du-Maurier" cigarette was given, the smoke of which contains only 33 percent of the nicotine present in the smoke of an ordinary market cigarette. These findings were further confirmed by the subjects who first smoked half a cigarette and later two cigarettes in succession. The changes in the angioscotoma in both tests differed in no way.

These observations are in complete disagreement from those of Fink[4] who thinks that the changes in angioscotoma are directly proportional to the amount of nicotine in tobacco.

In those subjects who were given alkaloid-free cigarettes, the angioscotometric changes were similar to after an ordinary cigarette. This seemed conclusive proof that the alkaloids of tobacco are not responsible for these changes.

The subjects who did not inhale the smoke did not show changes in angioscotoma, although nicotine was detectible in the saliva, which gave a white precipitate with Mayer's reagent. If nicotine were responsible for the dilatation of the angioscotoma, that absorbed by the mucous membrane of mouth, which is said to possess the power of absorption, could have effected the change.

The findings in subjects who were given tobacco to chew have been most interesting. No changes in the angioscotoma could be noted in spite of the fact that the tobacco contained an amount of nicotine equal to the smoke of one cigarette. This observation is in complete agreement with our view that tobacco alkaloids are not responsible for changes in the angioscotoma.

The factor in the smoke that produced all these changes in the angioscotoma may be due to irritation of the throat. It is common to find habitual smokers with a badly inflamed throat, the so-called, "chronic throat." This is probably due to deposition of easily condensible volatile products of tobacco smoke which irritate the mucous membrane of the throat. It was with this idea that 10 subjects had their throat irritated with a bland swab. The angioscotoma widened, although less in extent and duration than after smoking a cigarette because irritation with the swab was for a shorter period.

Summary

The effect of tobacco smoking on the normal angioscotoma does not depend on the brand of tobacco, its nicotine content, or the nicotine content of smoke. The alkaloids of tobacco are not responsible for the widening of the angioscotoma because similar changes could be produced by smoking an alkaloid-free cigarette. After chewing tobacco, no changes in angioscotoma could be detected.

The changes in the angioscotoma are probably due to the irritation of the mucous membranes of the throat by various volatile products of smoke. That the throat is the site of the changes was shown by those subjects who did not inhale and who did not show changes in the angioscotoma. Further, similar changes in the angioscotoma were produced by mechanical irritation of the throat.

It is fair to conclude that these changes in the angioscotoma are of little value in the early clinical diagnosis of cases of tobacco amblyopia, or in finding the best form, the harmless way, and the safe limit of consuming tobacco.

Irivin Hospital.

We wish to express our gratitude to the Indian Council of Medical Research for the financial assistance without which the work would have been impossible.

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AUSTRALIA AND NEW ZEALAND THROUGH THE OPHTHALMOSCOPE

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"Sed quaeres cui bono tot urbium commemoratio? Magno, modo una die spectaveris juxta doctrinam Hippocratis, nam natura loci intelliges qualis sit & mores habitantium, & quam partem praestet eligere, cui morbi regnent."*

(But, you will ask, to what purpose is this account of all these cities? There is a great value: for if you will look about you only a single day, according to the suggestion of Hippocrates, you will know what may be the nature of the place and the customs of the inhabitants, what section of the city it is better to choose, and what diseases are prevalent.)

On the occasion of the 1956 annual conferences of the Ophthalmological Society of Australia and Ophthalmological Society of New Zealand, I had the good fortune, together with Prof. Jules François of Ghent, Belgium, to be one of two overseas guests of the two societies.

The 16th annual meeting of the Ophthalmological Society of Australia was declared opened by the Governor of Queensland at the University of Santa Lucia in Brisbane. Dr. Peter English delivered the presidential address. He sketched a few of the earlier causes of blindness in Australia. One of these concerned bilateral optic atrophy that occurred among children who ingested the over-ripe fruit of a native loquat known as the finger cherry. This fruit was capable of causing blindness in both men and animals.

Another interesting and brilliant piece of clinical research described by Dr. English centered around cases of external rectus palsy, bilateral papilledema, and ultimate optic atrophy, noted especially among children. The victims of this syndrome were found to be nail biters. In searching for the source of poison, believed to be lead, the painted veranda rails of Queensland wooden houses became implicated. The paint, when exposed to strong sunlight, changed to a soft, powdery dust, which was transferred from fingers to tiny mouths. In the 1920s, lead poisoning in Queensland was comparatively common. At a clinical meeting in 1922, some 25 patients showed evidences of it. Dr. John Lockhart Gibson, former president of the Ophthalmological Society of Australia, and his colleagues conducted a vigorous fight for lead-free paint. They succeeded in having legislation introduced in Queensland forbidding the use of lead paints on veranda railings and in other areas that might be accessible to small children. Over the past 30 years, the disease had gradually declined and, in 1956, it has practically disappeared from the state.

Trachoma, known as "sandy blight," was another formerly frequent cause of blindness in Queensland. However, in Brisbane, the Wilson Ophthalmic Hostel, originally established for treatment of children afflicted with this disease, has closed its doors. Dr. English commented on the relative frequency of glaucoma among older patients exhibiting scarring of the lids, distortion of the lid margins, pannus, and corneal ulcers due to old trachoma. Though the disease is on the wane in Australia, it is still prevalent in the more remote sections of Western Australia, among aborigines, immigrants, and in New Guinea.

The scientific program of the meeting consisted of lectures, films, exhibits, case presentations, and panel discussions. It was carefully and interestingly planned and pleasantly broken up by morning and afternoon tea—a tradition which within recent years has been adopted in the United States and is known as the coffee break.

Prof. Ida Mann, of Perth, called attention to the present-day criteria established by the World Health Organization for the clinical diagnosis of trachoma. She stated that at

* Jerome Cardan of Milan (1501-1576). From Chapter 29, De Propria Vita Liber, written 1576; first published, Paris, 1643.

least two of the following objective findings should be present: (1) Follicles, conjunctival or limbal, (2) epithelial keratitis, most marked in the upper part of the cornea, (3) pannus in the upper part of the cornea, (4) typical scars.

The social program included a civic reception held by the lord mayor and aldermen of the city of Brisbane, the president's reception, the annual formal dinner of the society, sight-seeing trips, and other functions too numerous to mention. The wives of the delegates likewise had a full, varied program planned for them.

One of the highlights of the 1956 meeting was the coincidental announcement in the newspapers of an anonymous gift of 100,000 pounds, approximately a quarter million United States dollars, to the Ophthalmic Research Institute of Australia. This institute was originally sponsored by the Ophthalmological Society of Australia. It came into being largely through the efforts and enthusiam of Dr. Darcy A. Williams, of Sydney, and six other former presidents of the Ophthalmological Society of Australia. It is an independent body dedicated to research in any branch of ophthalmology. Membership is open to all members of the Ophthalmological Society of Australia (British Medical Association) and others who are invited to join. With this generous gift, it appears likely that the institute will have far-reaching beneficial effects upon ophthalmology and the public welfare in the commonwealth.

Research and scientific work in the past has been carried out by numerous outstanding Australian ophthalmologists. J. Ringland Anderson wrote books on *Hydrophthalmia, Retinal Detachment,* and *Ocular Vertical Deviations.* J. Bruce Hamilton also wrote three books: *A Guide to Ophthalmic Operations,* a translation of Sjøgren's *Keratoconjunctivitis Sicca,* and *Inheritance in Ophthalmology.* John L. Bignell designed a new type of ocular endoscope. This instrument utilizes the unique light-transmitting properties of a methyl methacrylate plastic tube. It permits a direct view of the ciliary body, optic disc, retinal vessels, and the ora serrata. Prof. Ida Mann's earlier contributions on the *Development of the Human Eye* and *Developmental Anomalies of the Eye* still rank as classics in ophthalmic literature. Her recent comprehensive ophthalmic surveys in large sections of Australia opened new avenues of investigation regarding the effects of race, diet, climate, and hereditary factors on diseases of the eye.

Arthur Joyce and his co-workers developed a technique for the homogeneous treatment of intraocular tumors with radon seeds. They used seeds made of capillary gold wire, 0.75-mm. thick and approximately 3.0-mm. long, of filtration equivalent to 0.3 mm. of platinum as permanent implants. These were sewn directly onto the sclera according to a calculated plan so that the tumor would get a homogeneous dose. The number, strength, and position of the seeds was worked out accurately according to the size of the tumor. They thought that any retinoblastoma up to one centimeter in diameter could be cured, and multiple tumors could be treated at one operation. They found that the reaction to radiotherapy was gradual and not violent. The tumor gradually shrank, became atrophic without affecting the rest of the retina.

Papers by Travers and MacIndoe on "Keratoplasty," Flynn on "Photoretinitis," D'Ombrain on "Pterygium," and others too numerous to mention are well known to those who keep abreast of English medical literature. Sir Norman McAlister Gregg's monumental contribution on the relationship between maternal rubella and congenital cataract has made his name familiar to medical men the world over. His conclusions suggest vast fields for investigation on the possible effects of other noxious intrauterine influences on the developing embryo.

Kate Campbell's report on retrolental fibroplasia published in 1951 was one of the earliest papers to call attention to intensive oxygen therapy as a possible cause of this disease.

At present, there are more than 200 ophthalmologists in the six states of Austra-

Fig. 1 (Holmes). Map of Australia, depicting outposts connected with flying doctor service bases.

lia. For the most part, they were educated at universities in Sydney, Melbourne, Brisbane, Adelaide, Perth, and more recently at Canberra. In the past they had received their training in ophthalmology (D.O.) abroad, usually in England. However, since suitable facilities have become available for ophthalmologic training in both Melbourne and Sydney, increasing numbers of young ophthalmologists are receiving their training locally.

The Ophthalmologic Society of Australia was primarily organized for the collection and dissemination of scientific knowledge among its members. It accomplishes this by periodic meetings, by encouraging scientific work and granting of prizes, by arranging for visitors from overseas for the purpose of lectures and demonstrations, and other means. Honorary memberships have been conferred by the society on such distinguished overseas lecturers as Algernon B. Reese and Frank B. Walsh from the United States, Air Marshal Sir Philip C. Livingston from Canada, Professor Weve from Holland, Henrick Sjøgren from Sweden, Lister, Sir John Parsons, Keith Lyle, James H. Doggart, John Foster, and A. B. Nutt from England, and Jules François from Belgium.

At the Victorian Eye and Ear Hospital in Melbourne the Ophthalmological Society of Australia maintains a large ophthalmologic library. This hospital is fortunate in having the services of Dr. C. H. Greer, noted ophthalmic pathologist. His contributions on precancerous melanosis, pigmented tumors of the conjunctiva, metastatic carcinoma of the iris and choroid, tumors of the orbit, and other subjects of importance in ocular pathology are familiar to readers of British medical journals.

The society is actively engaged in various activities relating to the practice of ophthalmology, the promotion of visual health, the prevention of blindness, and others.

Fellowship in the Royal Australasian Col-

Finger Cherry, *or* Native Loquat.

To the Children.

The Honourable the Minister for Education has given instructions that this picture should be printed and hung in the school, that you may know what the plant called Finger Cherry or Native Loquat looks like. The fruit of this plant may cause total blindness should you eat it or handle it and then rub your eyes. Because many children have eaten the fruit and have not gone blind is no reason for taking this terrible risk. It is only when the fruit is in a certain condition that it will cause you to become blind. You would not know in just what state the fruit was, and so you might be like one of those unfortunate children in the Blind Institute in Brisbane who lost their sight through eating Finger Cherry fruit.

Think of it, children! Never to see the sunlight again, the trees, the flowers, the faces of your companions and your loved ones. You would sit hour after hour in your home unable to read or to write, unable to romp and to play games, and always, always about you the black darkness of eternal night.

Here is a story which will prove how very true is all that has been said to you—

"A little girl ate Finger Cherry fruit one day. All that day she was quite well, she went to school, she played with her companions, and was as happy as a healthy, sure-free child could be. That night she went to bed, still quite well and strong. Soon she fell asleep and her parents heard no more sound from her room. Next morning she was not about early as was her custom. Her mother went to her room and called her; the child awoke and answered her. 'Get dear,' said the mother, 'why are you not up? You will be late for school.' The little girl replied, 'Mother, it is too early to get up yet, it is quite dark, will you please light the lamp.' Then the mother realised that her little daughter was totally blind. Bright sunlight streamed into the room, the child's eyes were wide open and appeared as healthy as usual, but never again would the wonders of that light fill her with happiness and joy. She would grow to young womanhood, to middle age, she would pass to the evening of life, till the dark angel of death called her. Never again, even though she live to be a hundred years old, will her sight return."

Some of these children who have gone blind in this way are now in the Blind Institute in Brisbane, far from their parents, their brothers and sisters, cut off from the happy companions of childhood, with days and weeks and years in which to sit quietly in the warmth of the blessed sun which their eyes shall never see again.

A great Sage once wrote, "Truly the light is good, and a pleasant thing it is for the eyes to behold the sun." These words were written thousands of years ago—they are as true to-day as then. Next to life, it is our most cherished possession, so guard it well. Wherever you know of a Finger Cherry tree growing, tell your parents and ask them to have it destroyed. Never eat or handle or have anything to do with Finger Cherries, lest you become like one of the children of whom we have just read.

Fig. 2 (Holmes). Warning poster exhibited in schools, cautioning against the dangers of eating finger cherry.

lege of Surgeons (FRACS) is regarded very highly. To qualify for membership, candidates are required to pass primary written examinations in anatomy, histology, applied physiology, and the principles of pathology. Prior to being permitted to appear for their final examinations before a Court of Examiners of the College, candidates must obtain the approval of the censor-in-chief of this court. They must also be able to answer technical questions on all phases of general surgery.

The commonest ophthalmologic lesion in Australia is pterygium. Among 3,000 new patients with eye complaints, one author found 9.7 percent with pinguecula and an additional 9.6 percent with pterygium. Another author reported 25 percent bilateral pterygium among 2,271 eye patients. Still another author found that among 400 operations on the eyeball, 40 percent were done for the removal of pterygium.

Exposure to glare from direct sunlight or to its reflection from water or other surfaces, as well as hot, dry winds, among people who live an outdoor type of existence is believed to be responsible for this high incidence.

One school of thought ascribes the chain of events as consisting of edema of the conjunctiva and episcleral tissues followed by pingueculum and, ultimately, pterygium.

Another school believes that Bowman's membrane is damaged as a result of evaporation of part of the water content of the cornea. The pterygium, therefore, may be considered as nature's protection of the exposed cornea.

Still another school believes that heredity should be considered in the etiology of pte-

rygium. Pedigrees of patients have been compiled, showing definite hereditary patterns from grandfather through father, brothers, and sisters, down to the grandchildren. According to this school, pterygium should be considered as a hereditary disease with dominant characteristics. In this regard, it has been argued that the frequency of pterygium among several generations is due to identical exposure to sun and wind in the same geographic area, rather than to inheritance.

Though bright sunlight appears to be the principal etiologic factor in the causation of pterygium, Australian ophthalmologists as a rule do not prescribe tinted lenses as a prophylactic measure because they fear glaucoma in patients over 40 years of age.

The treatment of pterygium consists of its surgical removal by one of several techniques. Postoperative radiation consisting of a single dose of 1,300 r of low voltage X rays or a corresponding dose of beta rays is advocated by a few surgeons. Subconjunctival injections of cortisone at the completion of surgery is recommended by others. The recurrence rate following surgical removal of pterygium is reported to be high, ranging from 10 to 20 percent. For the treatment of recurrent pterygium MacIndoe found lamellar keratoplasty highly effective.

Another frequent ophthalmologic lesion of special importance among the fair-skinned population of Australia is hyperkeratosis, or rodent ulcer. Walter Lockhart Gibson found 15,000 cases of skin cancer in a five-year period at the Brisbane Cancer Clinic. Cooper, at the Queensland Radium Institute, found that out of 10,000 cases of basal-cell carcinoma 1,000 involved the canthi or eyelids. These lesions affect both the young and old. They grow by predilection on the skin of the lids, the supraorbital regions, both canthi, and the skin of the cheeks. They arise from the deeper layers of epidermis or the sweat glands and present a characteristic microscopic appearance of ramifying and often pointed processes which invade the dermis and subcutaneous tissues. Exposure to weather and the ultraviolet end of the sun's spectrum are partially responsible for carcinogenesis. All forms of solar and senile keratosis are regarded with suspicion and treated as precancerous. The treatment of these lesions near the eyes is usually and preferably surgical excision or alternately radiation.

Current researches indicate that hyperkeratosis occurs more frequently among patients afflicted with pterygium. This observation, however, does not apply to aborigines, who show a high incidence of pterygium but no hyperkeratosis.

There are approximately 60,000 aborigines in Australia. They are brown-skinned, short in stature, living a nomadic existence or spending their time in government settlements.

Prof. Ida Mann conducted extensive ophthalmologic surveys among them as well as among natives of New Guinea. In certain areas, she reported an incidence of 50 percent trachoma. She ascribed this to their nomadic habits and low standards of hygiene. Her surveys also revealed the virtual absence of chronic marginal blepharitis, styes, iridocyclitis, sympathetic ophthalmia, strabismus, and glaucoma among the dark-skinned natives of both Australia and New Guinea. She postulated that the infrequency of glaucoma may be due to hereditary factors or to altered serum electrolyte balance of the aborigines, whose diet is poor in sodium and rich in potassium. Lastly, she called attention to differences in color vision between the aboriginal and white Australian population. Using the Ishihara charts, she found defective color vision among 7.3 percent of Australian males and 0.61 percent of Australian females. Her figures for the aboriginal population were only 1.9 percent for males and 0.031 percent for females.

Glaucoma among the white population of Australia, as in the United States and Europe, remains an important ophthalmologic

problem. It is responsible for approximately 20 percent of the blind population in Queensland and is the second commonest cause of blindness in the commonwealth. J. Ringland Anderson, of Melbourne, analyzed the occupations of his patients with glaucoma. His findings suggest that mental tensions and frustrations may play more important roles in causing ocular hypertension than physical exertion. He wonders whether glaucoma is "an inappropriate adaptation to nonspecific stress" and asks, "if the strains and stresses of the fourth and fifth decade produce the glaucoma revealed in the sixth decade." "If they do," he queries, "what prophylactic relaxation or philosophical peace can protect overworking and under-rested cells?" Whatever the final answer may be, he advocates that "we learn to prevent glaucoma by treatment in the decade preceding its apparent onset." If this hypothesis is accepted, it might lead to the development of increasingly sensitive, reliable, provocative tests and their administration to young people from 30 years of age and up. Anderson's sheet of instructions to patients with glaucoma, quoted below, is lucid, scholarly, and explicit.

ADVICE TO PATIENTS WITH GLAUCOMA

Explanation

1. You have been told you have glaucoma. Much can be done to help you.
2. The word—glaucoma—means that your eye is too hard.
3. The safety valve of the eye is blocked.
4. The eye may be softened by drops. If not, by operation.
5. Do not be misled because you see clearly when you look straight at an object. Glaucoma leaves that vision till the last.
6. Glaucoma need not cause any pain.
7. Glaucoma can develop without you knowing.
8. Glaucoma is not catching. It does not mean a growth.
9. The sooner it is treated, the more sight can be saved.
10. Formerly glaucoma always caused blindness. This is no longer necessary, but requires care.
11. You may not regain the sight you have lost, but you certainly should not lose any more.

Drops

12. Do not neglect your drops.
13. Make sure they get into your eye.
14. If they sting or blur your vision, never mind. Tell your doctor and carry on.
15. Better to have blurry eyes for a few minutes than be blind all your life.
16. When the doctor says "first thing on waking" he means it.
17. The drops may make your pupils small. Glaucoma tends to make them large.
18. You may need extra drops if you go to the cinema. Avoid upsetting topics.
19. If the drops fail to control the glaucoma an operation will be necessary. This should be painless and need not worry you.
20. *The greatest cause of failure is faulty use of drops.*
21. Don't repeat your drops too often without seeing your oculist.

General Health

22. Choose good print and illumination and stop reading if your eyes tire.
23. Wear dark glasses only if your oculist approves.
24. Avoid undue fatigue and worry, tight clothes, and low pillows.
25. Frequent small simple meals are better than large seasoned ones.
26. The less coffee and alcohol, the better. Avoid constipation and late hours.
27. *Cut rush out of your life.*
28. Be suspicious if your new glasses are not a real help, or if your vision is blurry after the cinema.
29. If you see coloured rings around lights, tell your oculist.
30. *Do not miss your next appointment.*
31. *If you see rainbows or have headaches or blurry vision, go back sooner.*

Glaucoma clinics have been established in several states. By bringing patients together, it is felt that they learn by example the necessity of regular observation and treatment.

Orthoptics in Australia is regarded more highly and is practiced more extensively than in the United States. Through the Orthoptic Board of Australia, technicans enjoy a close liaison with the Australian Ophthalmological Society. Orthoptists usually serve on the ophthalmic staffs of hospitals. However, several are in private practice, assisting in the diagnosis and treating

of patients referred to them by ophthalmologists.

A uniquely Australian medical service is an organization known as the Royal Flying Doctor Service of Australia. This organization, founded by the Very Reverend John Flynn, provides emergency medical service over the whole of the remote, sparsely populated inland section of the Commonwealth known as the "outback." It consists of physicians, nurses, and pilots who risk their lives when necessary over some of the worst flying conditions of the world to bring help to thousands of families who may be in urgent need of medical attention. The organization also depends heavily on wireless operators and other helpers who work often under trying conditions to throw a mantle of safety over the sparsely settled areas of Australia, consisting of isolated settlements, mining camps, cattle and sheep stations, and others. All settlements are contacted several times a day by the Flying Doctor Base Operator. Anyone wanting to consult a physician is connected by telephone for a personal consultation. When there is an urgent need, the physician calls up the pilot and often within a few hours the doctor has arrived and is preparing the patient for a plane trip to a hospital. The service covers nine tenths of Australia; one third of the commonwealth is served exclusively by it.

Australia is almost the same size as the United States. Its population is around 9,400,000 people, confined primarily to the coastal areas. They are largely of British stock and, since the end of World War II, "new Australians" from Central and Northern Europe. Australians spend most of their lives out of doors. They are marvelous sportsmen. In many ways Australians and Americans are alike. The cities are cosmopolitan, the roads are good, the hospitals are well equipped and up to date, and the people hospitable. It is indeed a land of great future and one that is destined to develop closer links with the United States.

New Zealand

New Zeland consists of two large islands and numerous small islands. It is about 1,300 miles from Australia.

The 11th Conference of the Ophthalmological Society of New Zealand met in Wellington from July 31st through August 3rd. The meeting was opened by the Hon. J. R. Hanan, Minister of Health. Mr. W. J. Hope-Robertson, who since the inception of the society has served as its secretary-treasurer, was inducted as president. The program, as in Australia, was of high caliber and consisted of excellent, interesting papers on diverse subjects. They included "Diabetic optic neuropathy," by Mr. L. G. Bell, "Cat-scratch fever," by Mr. G. de L. Fenwick, "Lamellar keratoplasty," by Mr. R. G. S. Ferguson, and interesting case presentations. This excellence was to be expected, as virtually all of New Zealand's ophthalmologists have received their advanced training in the British Isles and, in professional knowledge and skill, are the equals of their colleagues in the best medical centers of the world.

In conjunction with a discussion on the postoperative management of squint in children, several practical suggestions arose. One of these concerned discarding the physician's white gown. The group agreed that children's confidence could be gained easier and their co-operation maintained better if the oculist appeared in his street clothes. Another recommendation was to discharge young patients on the day of or the day after squint surgery with both eyes uncovered. Those participating in the discussion felt that they were justified in doing so, since many young children are prone to pull their bandages off or peek out from under them.

Ophthalmologic lesions in New Zealand are similar to those seen in the United States and Europe. However, pterygium occurs more commonly. Among 683 patients admitted to the eye department of the Auck-

Fig. 3 (Holmes). Glow-worm grotto at Waitoma caves, New Zealand. (The pupa stage of Bolitophita fly. Photograph of a postcard from New Zealand.)

land Hospital, Talbot found an incidence of 38.06 percent pterygium. In operating according to the McReynolds technique, his rate of recurrence was less than one percent. Coverdale reported on 305 patients. Prior to operating, he prescribes sodium sulfacetamide eye drops for several days. In his opinion, this step is responsible for his good postoperative results with a "very low" (two to three percent) recurrence rate. However, he calls attention to the ever present likelihood of recurrence, as the same causative factors remain in effect after operation as before operation.

In both New Zealand and Australia, hydatid disease caused by the cestode Echinococcus granulosus is a real problem. An Australasian Hydatid Registry is in existence, as the disease is peculiar to the two dominions. Fortunately, it rarely causes ophthalmic complications. When these do occur, they may involve the orbit, causing proptosis, or they may be secondary to cerebral involvement and cause papilledema and homonymous field defects. Positive diagnosis should not be made until skull and orbital X rays have been taken, blood studies have been done, and an exploratory operation performed. Cattle, sheep, and hogs are commonly the intermediary hosts of this parasite. The tapeworm is transmitted to man through the ingestion of food and water contaminated by fecal material from dogs that become infected as a result of eating offal. Intensive publicity and propaganda have been brought to bear on the subject and much work has been done in the education of the owners of the stock with regard to methods of reducing the incidence of this disease among animals and man. Man can also become infected by fondling infected dogs with hydatid cysts.

The Ophthalmological Society of New Zealand has been active in several matters of ophthalmology relating to the public welfare. Some of its projects included "Road safety in relation to eyesight," "A scheme for assessing incapacity due to injury of the

eyes," and others. In conjunction with this latter project, it is of interest that due to the wording of the law in New Zealand, a person who has lost the sight of one eye is granted a 50 percent disability.

Other ophthalmologic lesions of interest that had been discussed at past meetings of the society include capsular exfoliation and glaucoma capsulare. This subject was reviewed by Rowland P. Wilson, of the Department of Ophthalmology, Otago University School of Medicine at Dunedin. Dr. Wilson reported capsular exfoliation in 18 percent of cases of primary glaucoma. He divided the disease into three groups:

1. Capsular exfoliation without intraocular hypertension and without evidence of glaucoma.

2. Capsular exfoliation without intraocular hypertension but with field defects of the glaucomatous type.

3. Capsular exfoliation with intraocular hypertension and with definite glaucomatous field defects.

He noted that the average age for capsular exfoliation was 72 years. He advocated that miotics be used followed by a filtering operation for glaucoma. If lens extraction became necessary, he recommended that it be done via the intracapsular route.

C. A. Pittar, of Auckland, reported on a device for fixation of perforating corneal grafts called the corneal splint. This splint enabled him to keep the whole of the cut edge of both the graft and the bed covered and still left the central area of the graft completely free. Hope-Robertson has made valuable contributions on a large variety of important and timely subjects of ophthalmologic interest. The secretary of the society, Calvin C. Ring, of Auckland, is planning for the future to have frequent showings of American and British moving pictures, exhibits, and demonstrations of ophthalmologic interest.

New Zealand is a wonderland of scenery and a sportsman's paradise. My wartime experiences in scotopic vision were rekindled in visiting the subterranean glowworm grotto at Waitomo Caves. This cavern is dimly illuminated by soft blue-white pinpoints of light from thousands of tiny "glow worms." The latter are the larvae of a fly, arachnocampa luminosa, a fragile, slimy creature with a "rear light" which lures to the larvae's jaws the tiny flies or gnats hatched in the mud on the floor of the caves. I was advised that this sight must be viewed in complete silence, as any unaccustomed noise may cause the sensitive creatures to dim their brilliance.

New Zealand is responsible for the welfare of nearly two thirds of the entire Polynesian race. In addition to the 115,000 Maoris in the dominion, other Polynesians administered from the dominion are the islanders of the Tokelau Group, Niue and Cook Islands, Western Samoa, and Chatham Islands. The population of New Zealand is 2,000,000 people. Their outdoor life undoubtedly contributes to their longevity, which is high among that of the peoples of the world.

1013 Bishop Street (13).

Ophthalmic Miniature

Common spectacles, made as it were by chance, and, as it is vulgarly termed, though truly, "manufactured by wholesale" from all sorts of defective materials, even sometimes from common window glass, are much to be complained of.

H. Colburn, London, 1816.

BIOCHEMICAL STUDIES ON CATARACT*

VI. Production of cataracts in guinea pigs with dinitrophenol

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Since the early clinical reports by Horner, Boardman, Cogan, and others on cataracts after prolonged intake of dinitrophenol, an extensive clinical literature on these cataracts has accumulated. Horner reviewed this literature in 1942.[1] An identical type of cataract due to intake of dinitrocresol, which had been used in Scandinavia for weight reduction,[2] has also been described.

According to Horner, only 0.86 percent of all individuals who have ingested dinitrophenol are afflicted with cataract. No correlation to the amount of drug taken, or to the length of time used, or to the age of the patient could be established.

In view of the reported incidence, it is of interest that this cataract has been described in successive generations of a family,[3] and that some years ago dinitrophenol cataract was seen at the Wilmer Institute in a pair of identical twins. This suggests that a genetic predisposition plays an important role in susceptibility to this cataract. This notion is strengthened by the fact that, in spite of extensive experiments of long duration by many authors, it has been found impossible to produce dinitrophenol cataract experimentally in various other species, namely, in rats, rabbits, guinea pigs, and dogs, although Bettman[4] observed dinitrophenol cataract in a special strain of mice.

In contrast to the unsuccessful experiments in various other species, Robbins[5] was able to produce experimental dinitrophenol cataract in baby ducks and baby chicks with close to 100 percent results, although the upper age limit for the susceptibility was rather low. These observations have been essentially confirmed and somewhat extended by Bettman,[4] while Dietrich and Beutner[6] failed to produce cataracts with mononitrophenols in chicks.

Recently, Petty and Martin[7] observed some lowering of the onset of dinitrophenol cataract by Thiouracil but they could not lower the incidence of its occurrence.

In addition to the obvious genetic predisposition, the complexity of the pathogenetic problem is illustrated by the fact that (1) dinitrophenol cataract in birds develops acutely in contrast to the chronic cataract in human beings, and (2) it is, according to Bettman[4] and Buschke,[8] reversible in spite of the continued intake of the drug.

In view of these reports, it appeared to be desirable to pursue more systematic studies on other animals, such as guinea pigs and rabbits. The following experiments were designed to standardize the conditions for the experimental production of the dinitrophenol cataract, to test related compounds for their cataract-producing activity, and to clarify the cataractogenic agent of dinitrophenol metabolites.

Experimental

1. *Experimental animals.* Male guinea pigs weighing 200 to 300 gm. and white rabbits weighing approximately 2,000 gm. were used throughout. They were fed on a diet consisting of bean-curd waste (90 percent), wheat bran (five percent), casein (five percent) and sufficient vegetables. After feeding for two weeks under these conditions, the animals which gained body weight were selected for further experiments.

2. *Vitamin-C deficient diet.* Vitamin-C deficient diets used in these experiments were:

* From the Department of Ophthalmology, Osaka University Medical School. This work was reported at the annual meeting of the Society of Japanese Ophthalmologists, April, 1955, and was supported by a research grant from the Department of Education.

Tofukasu* (bean curd refuse) (autoclaved at 120°C. for 2 hr.)	90.0 percent
Casein	3.0 percent
Bran	5.0 percent
Butter	2.0 percent
Water	100.0 ml.

(Well mixed over a water bath)

3. *Administration of 2,4-dinitrophenol.* Ten to 200 mg. of 2,4-dinitrophenol were mixed with small amounts of basic diet and, after this mixture was fed completely, the vitamin-C deficient diet was given to the experimental animals.

4. *Collection of urine.* Rabbits were placed in the metabolism cages and 24-hour urine samples were collected in a vessel to which 100 ml. of 30-percent HCl and a small amount of paraffin liquid had been added. The urine was filtered before the experiments.

* Tofu (bean curd) is a Japanese food made of the soluble protein of soya bean. Tofukasu (bean curd refuse) is an insoluble residue.

Results

Experiment 1

Relationship between development of cataract and vitamin C

Guinea pigs were separated into the following two groups: One group was used for the test and the other group for the control. The test animals were fed on a vitamin-C deficient diet and administered 10 mg. of 2,4-dinitrophenol by mixing it with their diets.

The control animals, which were fed a vitamin-C deficient diet and injected with two mg. of ascorbic acid daily, received 10 mg. of 2,4-dinitrophenol daily.

As can be seen in Table 1, the test animals

TABLE 1

Development of cataracts in guinea pigs following administration of dinitrophenol

Vitamin-C Deficient Day	Test				Control	
	Experiment Animal Number					
	14	15	16	17	18	20
1	10 mg.	10 mg.	10 mg.		10 mg.	10 mg.
2	10 mg.	10 mg.	10 mg.		10 mg.	10 mg.
3	10 mg.	10 mg.	10 mg.		10 mg.	10 mg.
4	10 mg.	10 mg.	10 mg.		10 mg.	10 mg.
5	10 mg.	10 mg.	10 mg.		10 mg.	10 mg.
6	10 mg.	10 mg.	10 mg.		10 mg.	10 mg.
7	10 mg.	10 mg.	10 mg.		10 mg.	10 mg.
8	10 mg.	10 mg.	10 mg.	10 mg.	10 mg.	10 mg.
9	10 mg.	10 mg.	10 mg.	10 mg.	10 mg.	10 mg.
10	10 mg.	10 mg.	10 mg.	10 mg.	10 mg.	10 mg.
11	10 mg.	10 mg.	10 mg.	10 mg.	10 mg.	10 mg.
12	Death	10 mg.	10 mg.	Cat.	10 mg.	10 mg.
13		10 mg.	10 mg.		10 mg.	10 mg.
14		Cat.	10 mg.		10 mg.	10 mg.
15			10 mg.		10 mg.	10 mg.
16			10 mg.		10 mg.	10 mg.
17			10 mg.		10 mg.	10 mg.
18			Cat.		10 mg.	10 mg.
.					.	.
.					.	.
.					.	.
28					Death	10 mg.
.						.
.						.
.						.
57						10 mg.
Cataract	(−)	(+)	(+)	(+)	(−)	(−)

Test group: guinea pigs fed on a vitamin-C deficient diet only.
Control group: Guinea pigs fed on a vitamin-C deficient diet and injected daily with 2.0 mg. of vitamin C from the first day of experiment.
All animals were administered 10 mg. of dinitrophenol.

developed cataracts within 14 to 18 days. In these experiments, it is clear that there is a close relationship between the production of cataract and vitamin-C deficiency.

Experiment 2

Cataractogenic activities of various nitrophenol compounds

Cataractogenic activities of various nitrophenol compounds were examined. Guinea pigs fed on a vitamin-C deficient diet were injected daily with 2.5 or 5.0 mg. of various nitrophenol compounds, such as p-nitrophenol, o-nitrophenol, m-nitrophenol, 2-nitro-4-aminophenol, 2-amino-4-nitrophenol, and 4-nitro-6-cyclohexylphenol (fig. 1).

Table 2 shows that the animals developed cataracts following injection of p-nitrophenol, 2-nitro-4-aminophenol, 2-amino-4-nitrophenol, and 4-nitro-6-cyclohexylphenol and not following injection of other nitrophenol compounds. These results show that the optimal situation of radicals attached to the benzene ring is the presence of the hydroxyl-group and the nitro-group or the amino-group in para-position. In other words, one nitro-group in para-position of 2,4-dinitrophenol is of greater importance

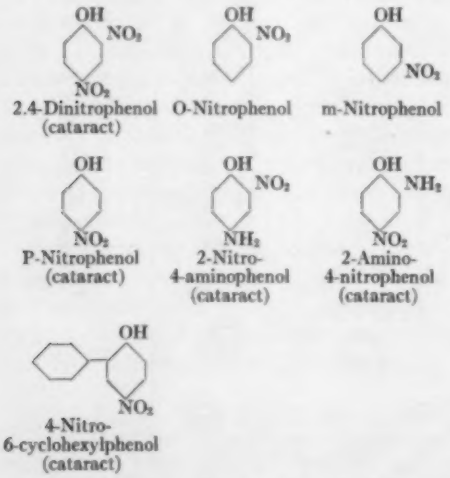


Fig. 1 (Ogino and Yasukura). Nitrophenol compounds used in this study.

TABLE 2

CATARACTOGENIC ACTIVITY OF VARIOUS NITROPHENOL COMPOUNDS

Compound	O-Nitrophenol			M-Nitrophenol			p-Nitrophenol			4-Nitro-6-cyclohexylphenol		2-Amino-4-nitrophenol		2-Nitro-4-aminophenol			
Animal No.	32	33	34	35	36	37	38	39	40	41	42	43	44	47	48	49	
Vitamin-C Deficient Day 1	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	
2	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	
3	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	
4	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	
5	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	
6	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	
7	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	
8	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	
9	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	2.5 mg.	
10	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	
11	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	Cat.	Cat.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	
12	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.			5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	
13	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.			5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	
15	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.			5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	
15	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.			5 mg.	Cat.	5 mg.	Cat.	Cat.	Cat.	Cat.	
16	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.										
17	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.										
18	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.										
19	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.										
20	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.	5 mg.										
Cataract	(−)	(−)	(−)	(−)	(−)	(−)	(−)	(+)	(+)	(−)	(+)	(−)	(+)	(+)	(+)	(+)	

for the development of cataract than one in ortho-position.

EXPERIMENT 3

Identification of cataractogenic substance

A. *Injection of ether fraction.* The urine of rabbits receiving daily doses of 50 to 70 mg. of 2,4-dinitrophenol per kg. of body weight was collected in a vessel containing about 300 ml. of 30-percent HCl and filtered. The urine samples were extracted 1,000 times with the same amount of ether. The ether fraction obtained was concentrated to one hundredth of its original volume and an equal amount of water was added. After this solution (Solution I) was adjusted to pH 7.0 with 2N · NaOH, one ml. was injected intraperitoneally daily into guinea pigs from the eighth day of vitamin-C deficient feeding.

As can be seen in Table 3, vitamin-C deficient animals (Group A) developed cataract within 12 to 14 days following injection of the ether fraction prepared from the urine of rabbits receiving 2,4-dinitrophenol. However, guinea pigs fed on a vitamin-C deficient diet and injected daily with 2.0 mg. of vitamin-C from the first day of the experiments (Group B) and control guinea pigs (Group C, Group D) injected with the ether fraction prepared from normal rabbit urine developed no cataracts.

From these experiments, it seems clear that a cataractogenic substance is excreted in

TABLE 3

DEVELOPMENT OF CATARACTS IN GUINEA PIGS FOLLOWING INJECTION OF ETHER FRACTION

Vitamin-C Deficient Day	Experiment								Times Injected
	Solution I				Solution I′				
	Group A Vit. C (−)		Group B Vit. C 2.0 mg.		Group C Vit. C (−)		Group D Vit. C 2.0 mg.		
	Animal Number								
1	24	25	26	27	28	29	30	31	
.									
.									
.									
7	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1
8	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	2
9	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	3
10	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	4
11	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	5
12	Cat.	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	6
13		1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	7
14		Cat.	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	8
.			.	.	.	.	.	.	.
.			.	.	.	.	.	.	.
.			.	.	.	.	.	.	.
18			1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	12
19			1.0×1			1.0×1	1.0×1	1.0×1	13
20			1.0×1			1.0×1	1.0×1	1.0×1	14
21			1.0×1				1.0×1	1.0×1	15
.			.				.	.	.
.			.				.	.	.
.			.				.	.	.
28			1.0×1				1.0×1	1.0×1	22
Cataract	(+)	(+)	(−)	(−)	(−)	(−)	(−)	(−)	

Group A and Group C: Guinea pigs fed on a vitamin-C deficient diet only.
Group B and Group D: Guinea pigs fed on a vitamin-C deficient diet and injected with 2.0 mg. of vitamin C from the first day of experiment.
Solution I. The ether fraction prepared from the urine of rabbits received dinitrophenol.
Solution I′. The ether fraction prepared from normal rabbits' urine. All animals were injected with 1.0 ml. of ether fraction from the eighth day of experiments.

the urine of rabbits administered 2,4-dinitrophenol and that vitamin C prevents the production of these cataracts.

B. *Experiments using lead acetate.* The solution obtained in the above experiment (Solution I) was mixed with lead acetate until no more precipitation occurred and then filtered.

After lead was removed from this filtrate by H_2S and H_2S was removed by bubbling CO_2 for 15 minutes, Solution II resulted. The precipitate formed was repeatedly washed with water and dried at room temperature. This dried precipitate was pulverized and suspended in water (10 times its weight) and treated with H_2S. The filtrate of this solution was concentrated to one-half its volume at low temperature (45°C.) under vacuum. This produced Solution III.

One ml. each of Solution II and Solution III was injected intraperitoneally daily into vitamin-C deficient guinea pigs, after the solutions were adjusted to pH 7.0 with lead carbonate.

Table 4 shows that the cataractogenic substance is not precipitable by lead acetate as a lead compound. From these data, it seems clear that the cataractogenic agent, one of the metabolites of dinitrophenol which is excreted in the urine, is not combined with lead.

C. *Experiments using Hopkins-Cole's solution.* To Solution II (the fraction treated with lead acetate), Hopkins-Cole's solution containing 10-percent mercuric sulfate in five-percent sulfuric acid was added. The mixture was kept at room temperature for several hours and filtered. The precipitate obtained was washed with water repeatedly and dried at room temperature.

This dried pulverized precipitate was suspended in an equal amount of water and

TABLE 4

DEVELOPMENT OF CATARACTS IN GUINEA PIGS FOLLOWING INJECTION OF SOLUTION II AND SOLUTION III

Vitamin-C Deficient Day	Experiment						Times Injected
	Solution II			Solution III			
	Animal Number						
	50	51	52	56	57	58	
1							
.							
.							
.							
8	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1
9	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	2
10	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	3
11	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	4
12	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	5
13	Cat.		1.0×1	1.0×1	1.0×1	1.0×1	6
14			1.0×1	1.0×1	1.0×1	1.0×1	7
15			1.0×1	1.0×1	1.0×1	1.0×1	8
16			1.0×1	1.0×1	1.0×1	1.0×1	9
17			Cat.	1.0×1	1.0×1	1.0×1	10
18				1.0×1	1.0×1	1.0×1	11
19				1.0×1	1.0×1	1.0×1	12
20				1.0×1	1.0×1	1.0×1	13
21				1.0×1	1.0×1	1.0×1	14
22							15
Cataract	(+)	(−)	(+)	(−)	(−)	(−)	

One ml. of Solution II or Solution III was injected into guinea pigs eight days after vitamin-C deficient feeding daily.
Solution II. The filtrate obtained after treatment with lead acetate.
Solution III. The precipitate.

TABLE 5

DEVELOPMENT OF CATARACTS IN GUINEA PIGS FOLLOWING INJECTION OF SOLUTION IV AND SOLUTION V

Vitamin-C Deficient Day	Experiment						Times Injected
	Solution V			Solution IV			
	Animal Number						
	59	60	61	69	70	71	
1							
.							
.							
.							
8	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1
9	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	2
10	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	3
11	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	4
12	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	5
13	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	6
14	1.0×1	1.0×1	1.0×1	1.0×1	Cat.	1.0×1	7
15	1.0×1	1.0×1	1.0×1	1.0×1		1.0×1	8
16	1.0×1	1.0×1	1.0×1	Cat.		1.0×1	9
17	1.0×1	1.0×1	1.0×1			Cat.	10
18	1.0×1	1.0×1	1.0×1				11
19	1.0×1	1.0×1	1.0×1				12
20	1.0×1	1.0×1	1.0×1				13
21	1.0×1	1.0×1	1.0×1				14
22							15
Cataract	(−)	(−)	(−)	(+)	(+)	(+)	

One ml. of Solution IV or Solution V was injected into guinea pigs eight days after vitamin-C deficient feeding daily.
Solution IV. The precipitate obtained after the treatment with Hopkins-Cole's solution.
Solution V. The filtrate.

bubbled with H_2S to remove Hg; then lead carbonate was added to remove H_2SO_4 and lead was removed with H_2S. The result was Solution IV. Hg and Pb were removed from the filtrate by the same method to make Solution V. Solution IV and Solution V were adjusted to ph 7.0 by 2N · NaOH and one ml. of each solution was injected intraperitoneally into guinea pigs from the eighth day of vitamin-C deficient feeding.

Table 5 shows that cataracts developed only in guinea pigs injected with Solution IV, not in animals injected with Solution V. In other words, a cataractogenic agent is precipitated by Hopkins-Cole's solution as a mercuric compound. (The procedures for the chemical analysis are illustrated in Figure 2.)

D. *Isolation of cataractogenic agent.* In the several experiments described, the following four points have been clarified:

1. Development of dinitrophenol cataract is closely related to vitamin-C deficiency.

2. A cataractogenic agent is excreted in the urine of rabbits receiving dinitrophenol.

3. This cataractogenic substance is not precipitated as a lead compound but is precipitated as a mercuric compound.

4. Hydroxyl- and nitro-radicals in the para-position of the benzene ring are important to the production of dinitrophenol cataract.

Taking these four points into consideration, an attempt was made to isolate the cataractogenic substance from the urine.

Twenty liters of acidified urine of rabbits which received a total of 30 gm. of dinitrophenol were extracted with ether and treated with lead acetate and Hopkins-Cole's solution. The procedures were the same as already described.

The solution obtained, Solution IV, was repeatedly extracted with the same amount of ether and the ether was evaporated gradually under reduced pressure and the black viscous

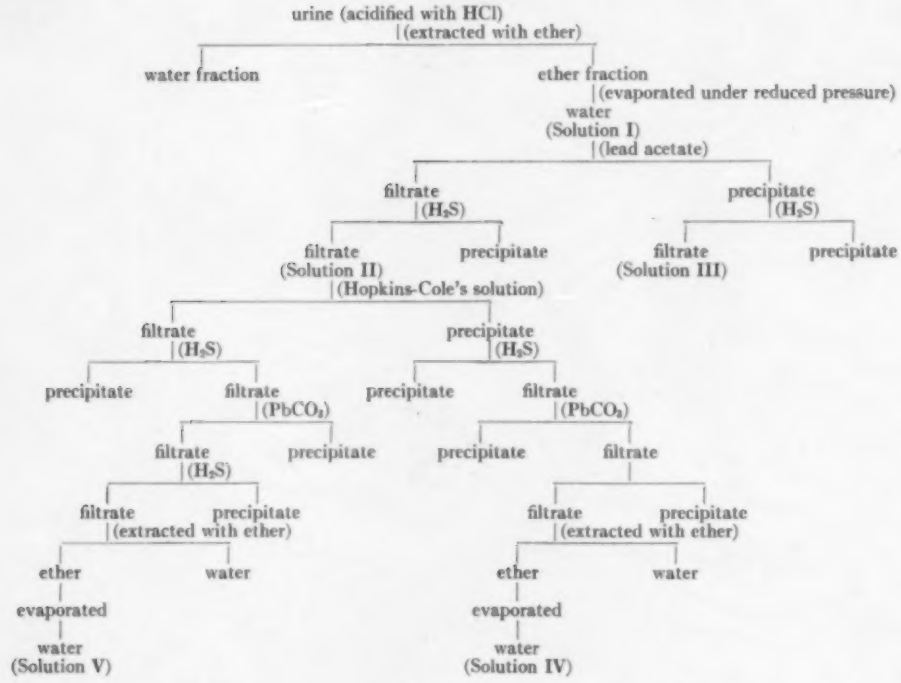


Fig. 2 (Ogino and Yasukura). Procedure used in the preparation of cataractogenic fractions from the urine of the rabbits receiving dinitrophenol.

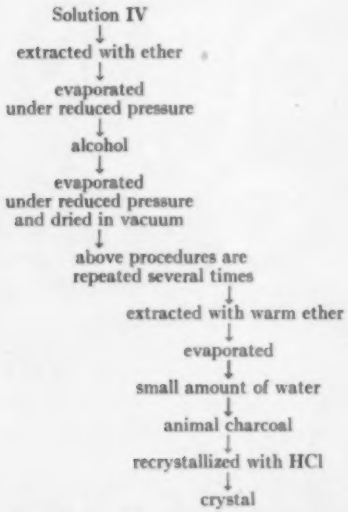


Fig. 3 (Ogino and Yasukura). Procedure used in isolating 2,4-diaminophenol.

residue was dissolved in a small amount of alcohol. After the alcohol was completely evaporated, the residue was extracted with warm ether and the ether was evaporated gradually at room temperature. The black amorphous crystals obtained were treated with animal charcoal and recrystallized with HCl. About 50 mg. of black brown needle-form crystals were obtained (fig. 3). The chemical nature of these crystals is presented in Table 6.

The absorption curve of these crystals was examined by Beckman's spectrophotometer. As Figure 4 shows, the peaks of absorption are found at 230, 285, 340 mμ in water. This absorption curve agrees with that of 2,4-diaminophenol (fig. 4).

These results indicate that this crystal is 2,4-diaminophenol.

TABLE 6

CHEMICAL NATURE OF CATARACTOGENIC CRYSTALS OBTAINED FROM THE URINE OF RABBITS RECEIVING DINITROPHENOL

Crystal form	Fine needle form
Color	Black-brown
Solubility	Easily soluble in water and alcohol Soluble in ether
Melting point	184–185°C.
Percentage of N	22.36%
KJO_3	Pale red
Ammoniacal $AgNO_2$	Black-brown
Millon's reagent	Red (positive)
$FeCl_3$	Red
Br	Red
Alcali medium	Orange
Bratton-Marshall reagent	Red-pink

EXPERIMENT 4

Cataractogenic activity of 2-amino-p-quinonimine

In the several previous experiments, it was shown that the cataractogenic fraction prepared from the urine of rabbits receiving dinitrophenol contains 2,4-diaminophenol. In a series of reports on experimental cataracts, we identified various quinoid substances as cataractogenic agents, such as beta-naphthoquinone in naphthalene cataract,[9] benzoquinone-acetic acid in tyrosine, galactose, and diabetic cataract,[10–12] dopa-quinone in black cataract,[13] and quinonimine-carboxylic acid in senile cataract[14] (fig. 5). 2,4-diamino-

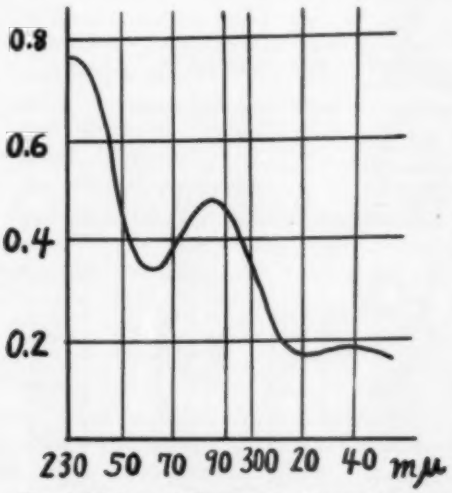


Fig. 4 (Ogino and Yasukura). Absorption curve of crystals isolated from the cataractogenic fraction of the urine of rabbits.

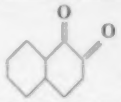
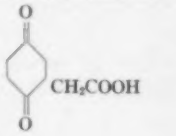
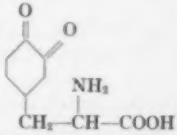
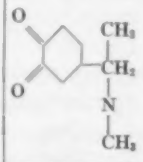
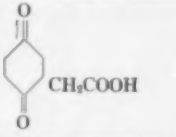
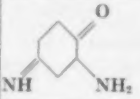
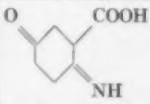
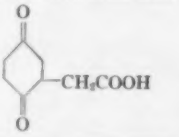
Cataract	Cataractogenic agent	Structural formula
Naphthalene cataract	Beta-naphthoquinone[9]	
Tyrosine cataract	Benzoquinone acetic acid[10]	
	Dopa-quinone[13] (Black cataract)	
	Adrenaline-quinone	
Galactose cataract	Benzoquinone acetic acid[11]	
Dinitrophenol cataract	2-Amino-p-quinoneimine	
Senile cataract	Quinoneimine carboxylic acid[14]	
Alloxan diabetic cataract	Benzoquinone acetic acid[12]	

Fig. 5 (Ogino and Yasukura). Cataractogenic substances demonstrated in the present study.

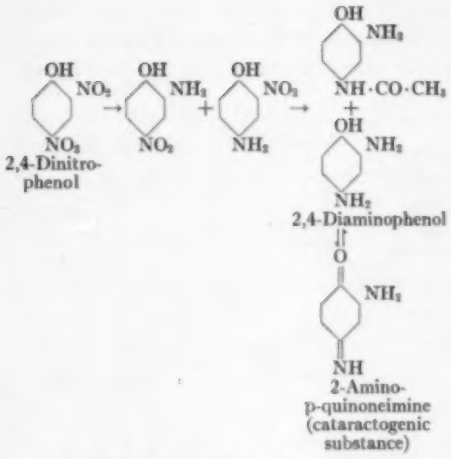


Fig. 6 (Ogino and Yasukura). Metabolism of dinitrophenol and cataractogenic substance.

phenol and 2-amino-p-quinonimine are interchangeable by adding or removing two hydrogen atoms, respectively, and form a redox system (fig. 6).

Considering these findings, it can be assumed that the cataractogenic activity of the urine of rabbits receiving dinitrophenol is due to 2-amino-p-quinonimine, one of the oxidized forms of 2,4-diaminophenol.

In examining the cataractogenic activity of 2-amino-p-quinonimine, 2-amino-p-quinonimine was prepared as follows:

Two hundred mg. of 2,4-diaminophenol were dissolved in 100 ml. of water and bromine was added as an oxidant. The excess bromine was removed by one drop of 10-percent ammonium rhodanide. One ml. of 2-amino-p-quinonimine was injected into guinea pigs from the eighth day of vitamin-C deficient feeding. As can be seen in Table 7, all animals injected with 2-amino-p-quinonimine developed cataracts within six days.

Experiment 5

Excretion of 2,4-diaminophenol

From the results described, there is little doubt that 2,4-diaminophenol is excreted in the urine of animal administered dinitrophenol. Two nitro radicals of dinitrophenol must, therefore, be reduced to amino radicals in vivo. Considering that Solution IV can reduce ammoniacal $AgNO_3$ and KJO_3, that this solution becomes yellow by additional HNO_3, and that the Bratton-Marschall reaction of Solution IV becomes more striking after hydrolysis with HCl, it may be assumed

TABLE 7

Development of cataracts in guinea pigs following injection of 2-amino-p-quinonimine

Vitamin-C Deficient Day	Test					Control	
	Experiment Animal Number						
	83	84	85	86	87	88	89
1							
.							
.							
.							
8	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1
9	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1
10	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1
11	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1	1.0×1
12	1.2×2	1.0×2	1.0×2	1.0×2	1.0×2	1.0×2	1.0×2
13	Dead	Dead	Cat.	Cat.	1.0×2	1.0×2	1.0×2
14					1.0×2	1.0×2	1.0×2
15					1.0×2	1.0×2	1.0×2
16					1.0×2	1.0×2	1.0×2
17					1.0×2	1.0×2	1.0×2

One ml. of 2-amino-p-quinonimine prepared from 2,4-diaminophenol was injected into guinea pigs by subcutaneous route one or two times a day. The control animals were injected with the same amount of water.

TABLE 8

EXCRETION OF 2,4-DIAMINOPHENOL AS ACETYL COMPOUND

Reaction	Solution IV*	After Hydrolysis with HCl
Phlorogluzin, Orzin test	(−)	(−)
Ammoniacal $AgNO_3$	Black brown	Black brown
KJO_3	Pale red	Pale red
$AgNO_3$	Yellow	Pale red
Bratton-Marschall test	(+)	(++)
Millon test	(+)	(+)

* Solution IV. The filtrate obtained after the treatment with Hopkins-Cole's solution.

that each part of 2,4-diaminophenol excreted is combined with acetic acid through its amino radical in para-position (fig. 6, table 8). Therefore, in the animal body, dinitrophenol is excreted partly unchanged, partly conjugated with glucuronic acid through its hydroxyl group, and partly reduced to 2,4-diaminophenol combined with acetic acid through its amino radical.

DISCUSSION

Dinitrophenol used in the treatment of obesity causes general toxic reactions in about one percent of individuals and a proportion of these may develop cataract after a long period. Horner[1] collected 177 cases from the literature; the majority of these occurred in women who had taken dinitrophenol as a reducing agent.

The effect of dinitrophenol is to increase the rate of metabolism and, in those tissues, like the lens, in which metabolism is predominantly anaerobic, the production of lactic acid is increased (Hall[15] et al.). It may also derange glycolysis by interfering with creatine metabolism (Krause[16]). In experimental work the only animals consistently found to be susceptible to dinitrophenol are young chicks in which the addition of no more than 0.25 percent of this drug to their food produces cataract in a high proportion of cases (Bettman[4]).

Buschke[8] states that they are neither cold cataracts nor due to dehydration, and he has noted a fairly close correlation with the effect of dinitrophenol on the basal metabolic rate. Robbins[5] has found that these cataracts are not prevented by the addition of extra riboflavin to the diet; however, the exact mode of production of these cataracts in animals is unknown.

The data we have obtained in these experiments indicate that:

1. Vitamin C prevents the production of dinitrophenol cataract.

2. Hydroxyl and nitro radicals of dinitrophenol in para-position are important to the development of cataracts.

3. The fraction containing 2,4-diaminophenol excreted in the urine of animals receiving dinitrophenol has cataractogenic activity.

4. Vitamin-C deficient guinea pigs develop cataracts following injection of 2-amino-p-quinonimine prepared from 2,4-diaminophenol.

On the other hand, it was shown in a series of reports on experimental cataracts, that various quinoid substances, such as beta-naphthoquinone in naphthalene cataract,[9] quinonimine-carboxylic acid in senile cataract,[14] benzoquinone-acetic acid in galactose, diabetic, and tyrosin cataract,[10-12] have cataractogenic properties.

Considering all these findings, it can be concluded that a cataractogenic agent in dinitrophenol cataract is 2-amino-p-quinonimine. This conclusion seems reasonable because the hydroxyl and nitro radicals of dinitrophenol in para-position are essential to the production of cataracts.

SUMMARY

1. Injection of ascorbic acid prevents the development of dinitrophenol cataract in vitamin-C deficient guinea pigs.

2. Of the various nitrophenol compounds, p-nitrophenol, 2-nitro-4-aminophenol, 2-amino-4-nitrophenol, and 4-nitro-6-cyclohexylphenol, in which the nitro and hydroxyl radicals are attached to the benzene

ring in para position, have cataractogenic activity.

3. A cataractogenic substance is excreted in the urine of rabbits administered dinitrophenol.

4. This cataractogenic substance is extractable with ether under acidified conditions and is precipitable with Hopkins-Cole's solution as a mercuric compound but is not precipitable with lead acetate as a lead compound.

5. By treating the urine of rabbits receiving dinitrophenol with ether, lead acetate, Hopkins-Cole's solution, and alcohol, black-brown needlelike crystals are isolated from the fraction having cataractogenic activity.

6. These crystals are identified as 2,4-diaminophenol by their various chemical properties, such as melting point (184 to 185°C.), nitrogen analysis (22.36 percent), absorption curve (three peaks at 230, 285, 340 mμ), and various color reactions.

7. 2-amino-p-quinonimine prepared from 2,4-diaminophenol produces cataracts in a high proportion of vitamin-C deficient guinea pigs.

8. One part of dinitrophenol is excreted as 2-amino-4-acetylaminophenol.

9. The metabolism of 2,4-dinitrophenol and 2-amino-p-quinonimine as cataractogenic agents in dinitrophenol cataract is discussed.

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TREATMENT OF RETINAL ARTERY OCCLUSIONS*

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Two years ago, by the fortunate accident of being in the right place at the right time, I was able to report the successful treatment, by retrobulbar therapy, of three cases of retinal artery occlusion (Weerekoon, 1955). Since that time, a further 14 cases have been seen and treated by me, seven at the Western Ophthalmic Hospital, London, and the remainder at the General Hospital, Galle. A report of all 17 cases is made in this paper. Brief notes on the three cases already reported are given here both for completeness and for comparison.

HISTORICAL REVIEW

The pathology of retinal artery occlusion is still being debated. The original explanation that every case resulted from an embolus can now be discarded as wishful thinking, except, perhaps, on that rare occasion when the embolus is seen to shift along the length of an artery while the fundus is under direct observation. Excepting such an unusual circumstance, and when a cardiac history is available in support of this view, it is extremely unlikely that an embolus can be held responsible for the tragedy.

A local vascular accident by way of a thrombosis has also been put forward as a possible explanation, and this is still generally accepted, for want of a better one, perhaps. Admittedly, nothing in the general condition of the patient, except, perhaps, the age of some of the victims (past middle life) with its inevitable arteriosclerosis and endarteritis, can lend positive support to this view. Unfortunately, too few eyes blinded by this affliction have been critically examined under the microscope.

A third suggestion—that spasms of the vessels are responsible—has also been made but has not been universally accepted. Certainly arterial spasm does follow closure of a vessel by a thrombus or an embolus or from any other blockage of the lumen. Experimental evidence of this occurrence in the retinal vessels has been provided by Uhthoff. On the other hand, there does not appear to be any valid reason for assuming that spasm must necessarily follow the vascular accident; it could just as well occur independently of any thrombosis or embolism or other injury to the vessel. Why this should occur it would be impossible to predicate here any more than in Raynaud's disease. Clinically, moreover, no other pathologic lesion is usually discoverable. Each system examined has revealed nothing abnormal but it has been noticed, especially in one series of cases (see later), that the age incidence was lower, namely, under 40 years. Most of these patients, in addition, gave a history of "cold fingers" that is, there was usually some evidence of peripheral vascular instability, perhaps from some sympathetic-parasympathetic imbalance. A history of remissions, too, was often available.

Passing reference might here be made to a small group of cases that are an extension into the retinal or ophthalmic artery of the pathologic condition of temporal arteritis. Here the occlusion forms but a small part of a larger pathologic picture. Such cases are not included in the present discussion. In these cases obstruction is from without, that is, from the vessel wall itself which, by its round-cell proliferation and necrosis, gradually occludes the lumen. Treatment with systemic ACTH has so far been unsatisfactory.

It would appear, therefore, that cases could be broadly classified under two heads:

In the *first group* are those patients who are past middle life and are arteriosclerotic

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and/or hypertensive, that is, they have a general background that is eminently favorable to a vascular accident like a thrombosis.

In the *second group*, the patients are young adults and show no other abnormality except, perhaps, a history of cold finger tips or migraine or other vasomoter instability. These patients usually have had similar attacks on some previous occasion with remission of symptoms. In this group arterial spasm obviously is the major, if not the sole, factor responsible for the occlusion.

Though pathologic evidence is presently unlikely to be forthcoming to bear out the assumption, it is probable that arterial spasm is present in every case of occlusion from whatever cause, whether secondary to a thrombosis, or as a primary factor, or even in those rare cases of embolic origin. Once this premise has been accepted, that is, that arterial spasm is a factor in the production of retinal occlusion, treatment must obviously be directed toward relieving the spasm. Vasodilators must be used and used intensively and immediately. Cases of arterial thrombosis, however, would be benefited by the use of anticoagulants in addition to vasodilators.

Methods of treatment

Medical

a. Amyl nitrite
b. Ocular massage
c. Sodium nitrite intravenously
d. Nicotinic acid
e. Acetylcholine
f. Priscol (imidazoline hydrochloride)
g. Ronicol (β-pyridyl-carbinol)

Surgical

a. Paracentesis
b. Stellate ganglion block

The very variety of treatments appears to suggest their inefficacy but each has its firm adherents. For instance, Stallard (1955) advocates paracentesis to lower the intraocular pressure and so encourage the embolus to shift its tragedy to a smaller and less important arterial branch. Needless to say, this happy outcome is seldom realized.

Campbell Orr, and Young (1935) prefer an injection of acetylcholine, subconjunctivally just behind the equator, as the most effective method of producing local vasodilatation. They attribute incidental shock or ocular palsies (Reed and Payne, 1954) to misplaced enthusiasm and stress that these disasters are likely to follow only if the acetylcholine is given into the cone of muscles, that is, retrobulbarly.

Ocular massage combined with an inhalation of a capsule of amyl nitrite has its supporters among the more timid. No surgical interference here, not even so drastic a procedure as an injection! Nevertheless, this therapy has its adherents and probably its successes. Certainly it should not be ignored in an attempt to overcome vascular spasm if more effective methods are not readily available.

Intramuscular and intravenous vasodilators are the next possible therapy, and quite a few successes have been reported, especially with nicotinic acid intravenously, though today this treatment is usually combined with one or more of the others. Oral vasodilator therapy could similarly be classified under supplementary treatment and needs no further mention here.

The next step in the evolution of vasodilator therapy was obviously to get it even closer to the vessels concerned. Retrobulbar injection appeared to be the answer in the hope that these drugs would act directly on the sympathetic nerve terminals in the smooth muscle of the arteries and arterioles. This led to the trial of a variety of these peripheral-acting vasodilators by the retrobulbar route—nicotinamide (Galla, 1948), Priscol (Thiel, 1951; Weerekoon, 1955), acetylcholine (Michaelson, 1948), and Ronicol (Furtado, 1949, and as reported in this paper).

The final advance in therapy was the development of the technique of stellate ganglion block in an attempt to reduce sympa-

thetic overactivity. An injection of Novocain given directly on to the stellate ganglion has proved effective in a number of cases.

Case reports*

A. Cases treated with Priscol

Case 1

A woman, aged 59 years, suffered sudden loss of vision of left eye. Vision was: R.E., 6/5; L.E., counting fingers at six inches. There was no previous history of similar attacks. She was mildly hypertensive. The left fundus showed retinal edema with fragmentation of the blood column in the superior temporal artery. No cherry red spot was present. She was treated with Priscol retrobulbarly and orally. Final vision in the left eye was 6/9.

Case 2

A man, aged 43 years, saw a curtain over his right eye the previous evening. Next morning no vision was present below the horizontal meridian. He had a history of a similar sudden loss of vision two months previously from which he recovered completely. Vision was: R.E., 6/36; L.E., 6/6. The field of the right eye was restricted below the horizontal meridian. He was treated with Priscol retrobulbarly, two times, and orally. Final vision in the right eye was 6/5, with a fuller field.

Case 3

A man, aged 71 years, suffered sudden loss of vision seven days previously. Vision was: R.E., hand movements only. L.E., 6/6. Retinal edema and a cherry red spot were present in the right eye. He was treated with Priscol retrobulbarly, and Priscol and nicotinic acid orally. Final vision in the right eye was 6/60.

Case 4

A man, aged 51 years, suffered sudden loss of vision in the left eye after bumping his head. Vision was: R.E., 6/9; L.E., perception of light in the extreme temporal field only. He was hypertensive. In the left eye there was macular edema with a cherry red spot. He was treated with retrobulbar Priscol two times and Priscol and nicotinic acid orally. Final vision in the left eye was counting fingers at six inches, with a central scotoma.

Case 5

A man, aged 51 years, suffered loss of the lower part of right visual field five days previously, after a bout of drinking. Corrected vision in each eye was 6/6. There was restriction of field in the right eye below the horizontal meridian. Retinal edema with spasm of the superior division of the central retinal artery was present in the right eye. He was treated with retrobulbar Priscol and Priscol and nicotinic acid orally. Final vision in the right eye was as before, 6/6 with glasses, but the field was larger though still rather restricted below.

Case 6

A man, aged 42 years, suffered complete and sudden loss of vision in the right eye. Vision gradually returned but now blurring was present in the lower half of the field. He had had thrombophlebitis of the right leg for the last year. Vision was: R.E., 6/6; L.E., 6/5. Retinal edema was present along the superior temporal vessels. He was treated with Priscol retrobulbarly and orally. Final vision was: R.E., 6/6, with a much smaller scotoma below.

Case 7

A woman, aged 56 years, suffered sudden visual loss in the left eye. It started "as if looking through lace-curtains." Complete blindness followed. This kept coming and going during the day. She had a history of migraine. Vision was: R.E., 6/12, with glasses; L.E., 6/36, with glasses. She was treated with retrobulbar Priscol on the fourth day when a correct diagnosis of occlusion was made and the case was referred to me. Final vision was unchanged with persistence of a small central scotoma.

Case 8

A man, aged 80 years, had gradually failing vision in the right eye which faded to complete blindness in two minutes, two days ago. The left eye had been blind since childhood. Vision was: R.E., perception of light only. Peripapillary edema was present. No cherry-red spot could be seen. He was treated with Priscol retrobulbarly and orally. Final vision showed no improvement.

Case 9

A man, aged 74 years, had been blind in his right eye for one week. He had a history of diplopia two months ago. A Hess chart taken at the time showed right external rectus palsy. Vision in that eye at the time was 6/6 with glasses. Now vision is: R.E., no perception of light; L.E., 6/9. He was treated with Priscol retrobulbarly and orally. No change could be demonstrated.

Case 10

A woman, aged 70 years, suffered sudden painless loss of vision of the right eye two days ago. Vision was: R.E., hand movements only; L.E., 6/9, with glasses. She was hypertensive. Retinal edema and a single retinal hemorrhage in the right upper temporal region were present. She was treated with Priscol retrobulbarly and orally. No change could be seen.

B. Cases treated with Ronicol

Case 11

A man, aged 40 years, suffered loss of vision eight days ago. There were remissions but now vision was: R.E., 6/9; L.E., 6/60. Macular edema but no cherry-red spot was present. He was treated with Ronicol retrobulbarly, two times, and vitamin B orally and intramuscularly. Final vision in the

* *Note.* Cases 1 to 3 were previously reported in detail in the *British Journal of Ophthalmology*, February, 1955.

left eye was 6/6. (Note: This patient returned several months later with a central corneal opacity. He admitted to having taken other treatment for a "red eye" that he had developed about two months after leaving the hospital. It is unlikely, therefore, that this opacity was in any way related to the retrobulbar therapy.)

CASE 12

A woman, aged 30 years, had misty vision for 10 days. Total blindness developed today. There were remissions over this period and a history of numbness and coldness of the finger tips. Vision was: R.E., no perception of light; (with a dilated, fixed pupil); L.E., 6/6. The right macula was edematous. She was treated with Ronicol retrobulbarly, two times, and vitamin B compound, orally and intramuscularly. Vision in the right eye was restored to 6/6 on third day of treatment. Final vision in this eye was 6/6, with a full field.

CASE 13

A man, aged 28 years, had had defective vision in the right eye for 10 days. Vision was: R.E., 3/60; L.E., 6/6. There was right retinal edema with a cherry-red spot. He was treated with Ronicol retrobulbarly, two times, and with oral and intramuscular vitamin B. Vision on discharge in the right eye was 3/60, that is, unchanged. A little more than three months later, vision in that eye was 6/9. He had been on oral vasodilators in the meantime.

CASE 14

A woman, aged 20 years, had loss of vision in right eye of one day's duration. Vision was: R.E., 4/60; L.E., 6/6. Macular edema with cherry-red spot could be seen in the right eye. She was treated with Ronicol retrobulbarly, and with oral and intramuscular vitamin B. Final vision in the right eye was 6/6.

CASE 15

A man, aged 19 years, had repeated attacks of blurred vision over a period of one month. Now his condition was worse and he was afraid he was going blind. Vision was: R.E., 6/18; L.E., 6/6. Macular edema and cherry-red spot were seen in the right eye. He was treated with retrobulbar Ronicol and vitamin B orally and systemically. Final vision in the right eye was 6/6.

CASE 16

A man, aged 32 years, showed blurring of the right temporal field for two weeks. Vision was: R.E., 6/18, J3; L.E., 6/6 and J1. The right field was full but the target was seen as through a mist. Macular edema but no cherry-red spot could be seen. He was treated with Ronicol retrobulbarly and vitamin B orally and intramuscularly. Final vision was: R.E., 6/9, clearly, and 6/6 with some difficulty, J1. The field was full, with no blurring of the target.

CASE 17

A man, aged 27 years, suffered sudden loss of right vision one month ago. He had become worse. Vision was: R.E., 6/36; L.E., 6/9. Right macular edema was present. He was treated with retrobulbar Ronicol and intramuscular nicotinic acid. Final vision in the right eye was 6/12.

COMMENT

It appears that any vasodilator would be effective provided there are no contraindications to its use and provided it is given early enough. Acetylcholine should not be given, for instance, without bearing in mind the possibility of precipitating an ocular palsy, or of causing opacification of the cornea (Payne and Reed, 1954). The preferred site of injection appears to be into Tenon's capsule just behind the equator. Priscol is painless when given retrobulbarly and is quite effective. It is contraindicated, though, in coronary disease and in peptic ulcer because of its histaminelike action. It should also be used with caution in diabetes, as there have been instances of extensive retinal hemorrhages (Campbell Orr, 1955). Ronical, the alcohol of nicotinic acid, is rather more painful than Priscol when given by the retrobulbar route but appears to be equally harmless. Certainly its effectiveness cannot be questioned.

SUMMARY

The methods of treating retinal artery occlusions have been reviewed. Brief comments on the effectiveness of each have been offered. Seventeen cases treated with retrobulbar vasodilators followed by systemic treatment have been reported. In many of these cases useful vision was restored. I feel that in all the cases spasm was the cause of the occlusion. My arguments for immediate and intensive therapy with vasodilators have been reiterated.

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Acknowledgment is gratefully made to the surgeons of the Western Ophthalmic Hospital, London, for permission to report on Cases 1 to 10, which were treated by me while working under their direction in 1954-1955. The other cases were seen at my clinic at the General Hospital, Galle, Ceylon.

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FINE STRUCTURE OF CHLAMYDOZOON TRACHOMATIS*

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In a previous communication,[1] we reported on the electron microscopic findings of trachoma virus, Chlamydozoon trachomatis, as observed in thin sections. In that pilot study, we employed a handy electron microscope which was very helpful. However, a higher resolution power and a higher accelerating voltage were desired to clarify the finer structure of the virus. In the present study, therefore, the previous apparatus (Akashi TRS-50B, with 50KV accelerating voltage and 30Å resolution power†) was used for a screening test and a new apparatus (Hitachi HU-10A, with 100 KV accelerating voltage and 15Å resolution power†) was employed for the final examination. Thus, some of the findings and explanations described in the previous report were confirmed and some others were corrected. Some new findings were also established.

The experimental material and method were much the same as those of the previous study.

* From the Department of Ophthalmology, Kumamoto University Medical School. Supported by a grant-in-aid from the National Council to Combat Blindness, New York. We are indebted to Mr. S. Tsuchikura for his technical assistance. We also wish to thank Dr. and Mrs. Thygeson who assisted in the preparation of this paper.

† According to the specifications of the manufacturing companies.

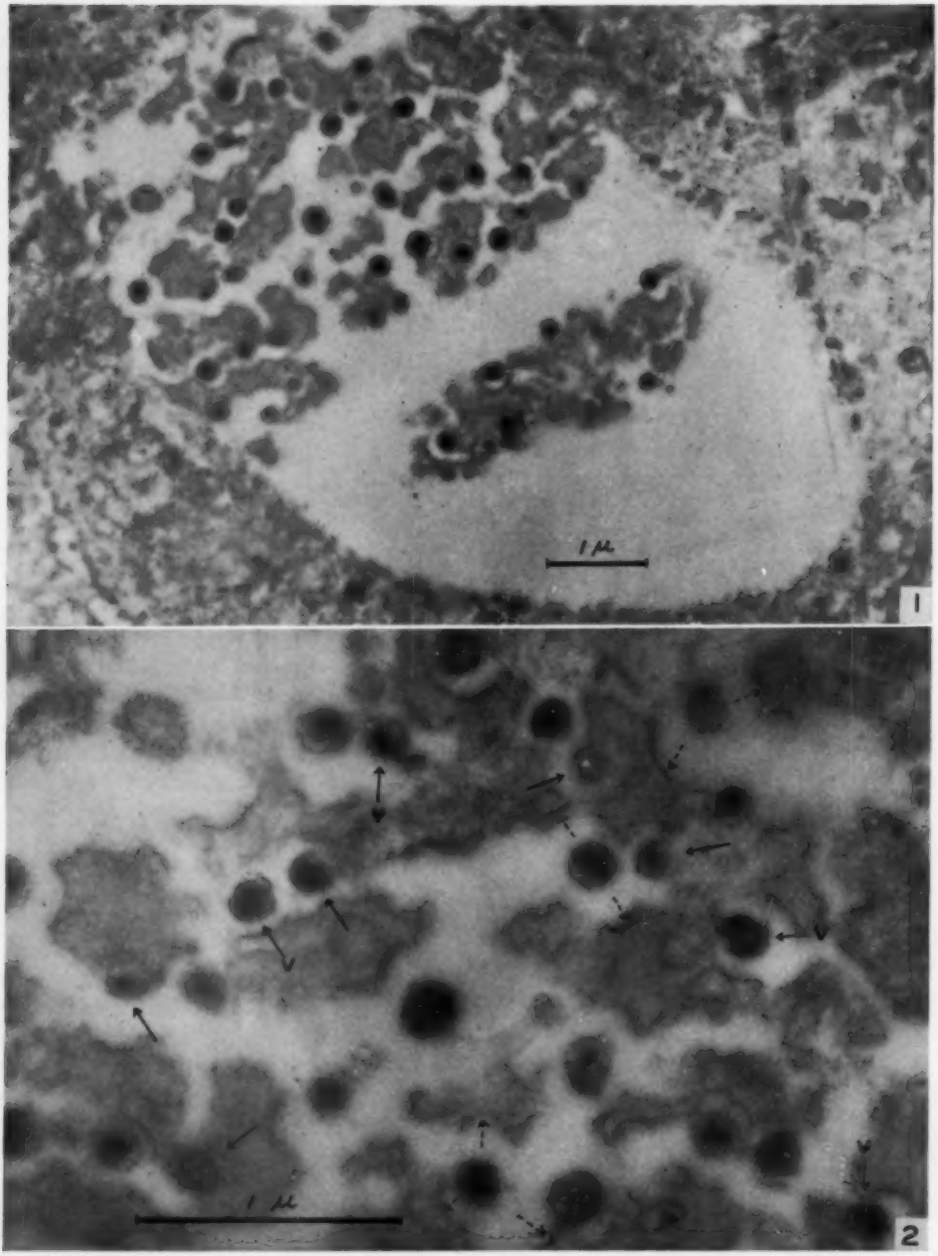
Results

Figure 1 illustrates a survey picture of a "relatively early stage inclusion" as described in the previous report. Figure 2 is the same inclusion at a higher magnification. Figure 3 is a survey picture of an inclusion supposed to be of a more advanced stage and Figure 4 is a "full grown elementary body inclusion" at high magnification. Figures 5 through 8 show a "vegetative form-elementary body relationship" in early stage inclusions.

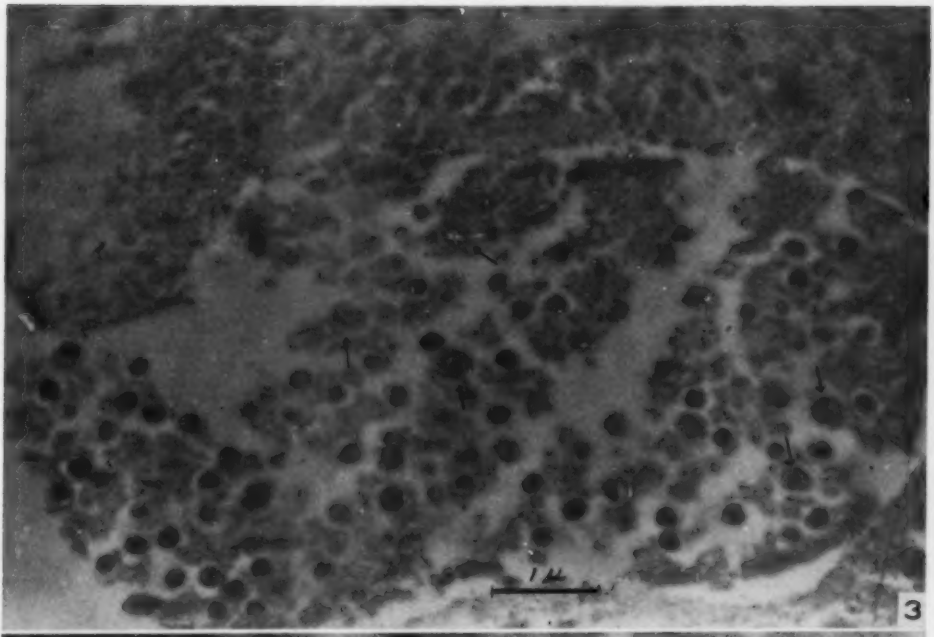
Figures 9 through 14 illustrate the fine structures of elementary bodies at high magnifications; Figures 9 to 13 are elementary bodies in an early stage inclusion and Figure 14, those in a full-grown elementary body inclusion. Figures 15 and 16 illustrate some special findings of viral corpuscles, probably initial bodies. Figure 17 is a representative picture, showing the process of "envelope formation" which will be discussed later.

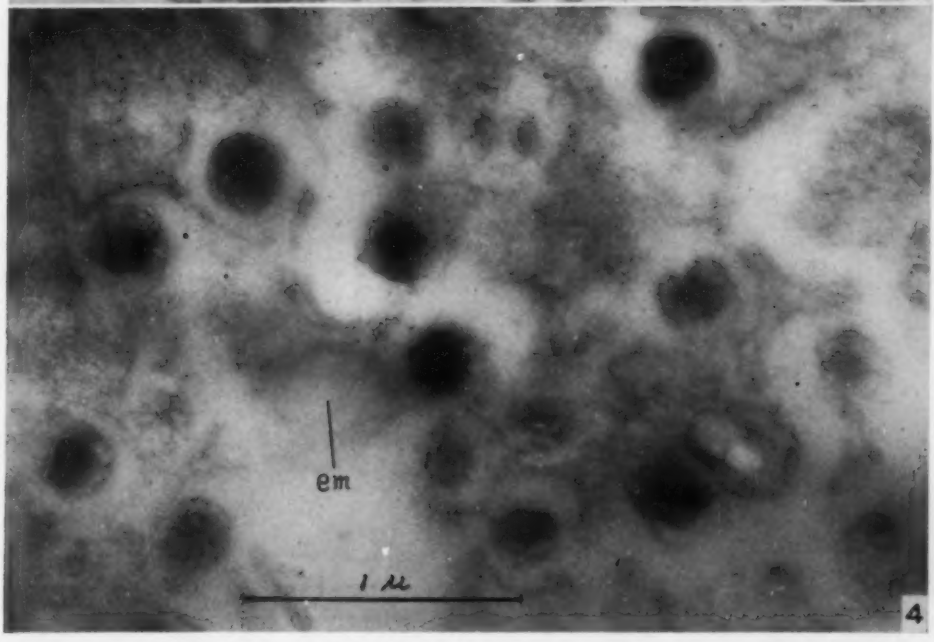
Vegetative form—elementary body relationship

In the previous study, it was suspected that a vegetative form, "polygons," might be present in the developmental cycle of the trachoma virus. The polygons are an amorphous substance often having a polygonal struc-



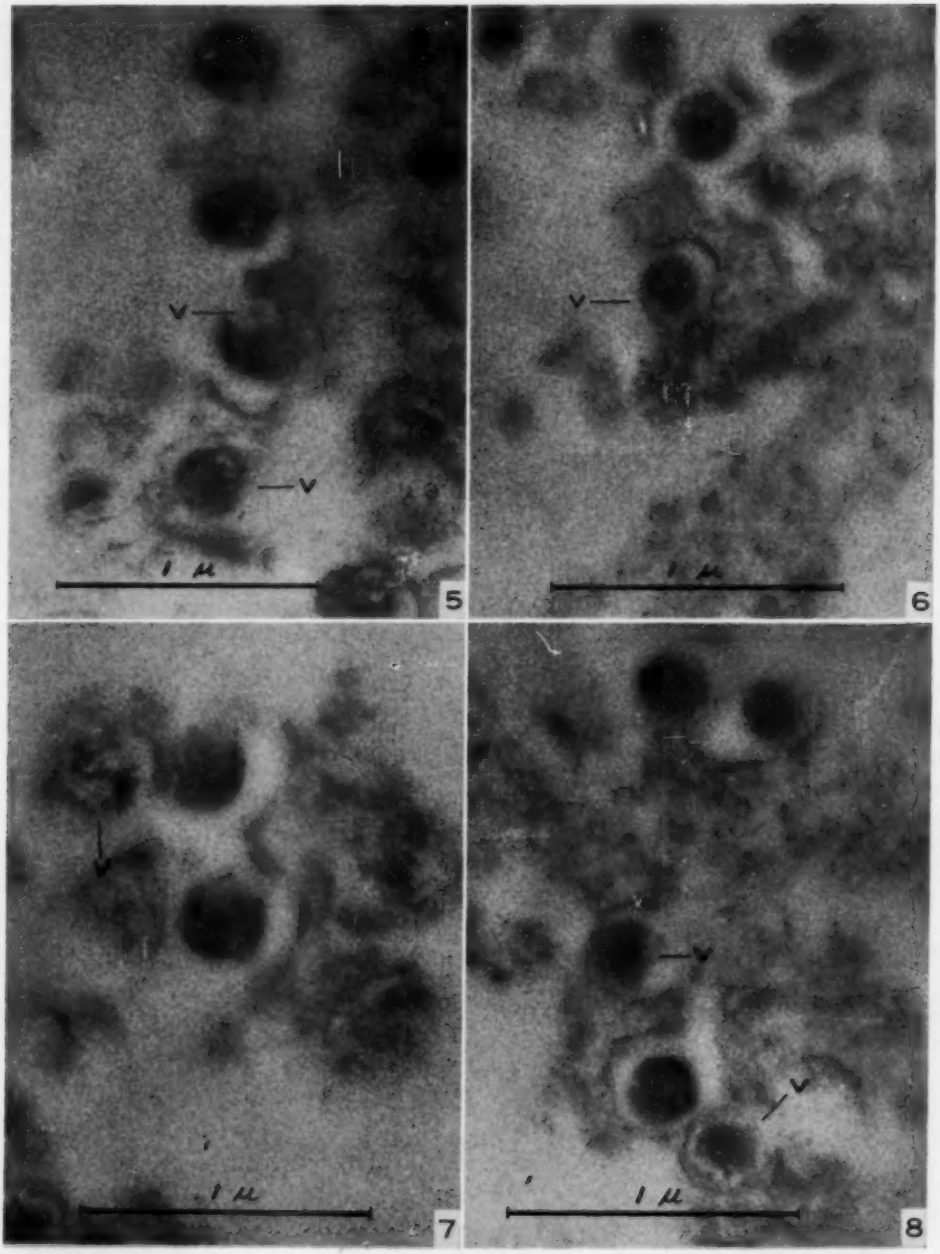
Figs. 1 and 2 (Mitsui, et al.). A survey picture of a relatively early stage inclusion and the same inclusion at a higher magnification. The polygons are abundant, the elementary bodies relatively small in number. Polygons consist of a dull membrane, minute granules, and homogenous ground-substance. Many of the elementary bodies seem to be produced from the polygons, as indicated by solid arrows. In some of them, a spiral or vortex figure is suggestive (v). Indentation of the polygon wall is obvious, particularly on the surface facing the elementary bodies, as indicated by the dotted arrows. (Fig. 1, ×16,000; fig. 2, ×42,000.)



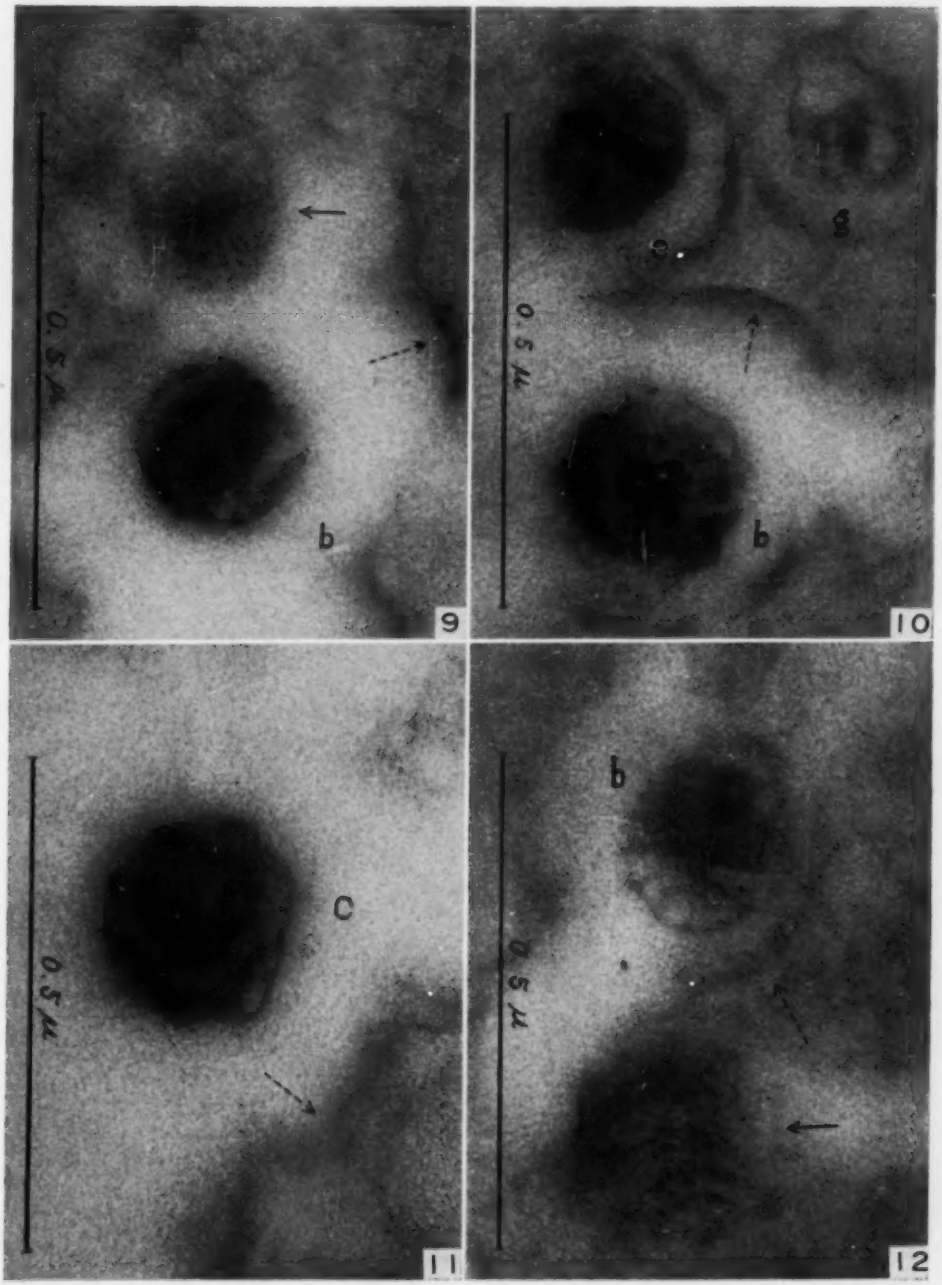


Figs. 3 and 4 (Mitsui, et al.). (Fig. 3) A survey picture of an inclusion at an advanced stage. There is an increased number of elementary bodies. Polygons are more granular than in the inclusion in Figure 1. The enveloping process is obvious at the left. Some larger granules with a double-ring structure are seen (arrows). They may be the initial bodies by an ordinary microscope. (×15,600.)

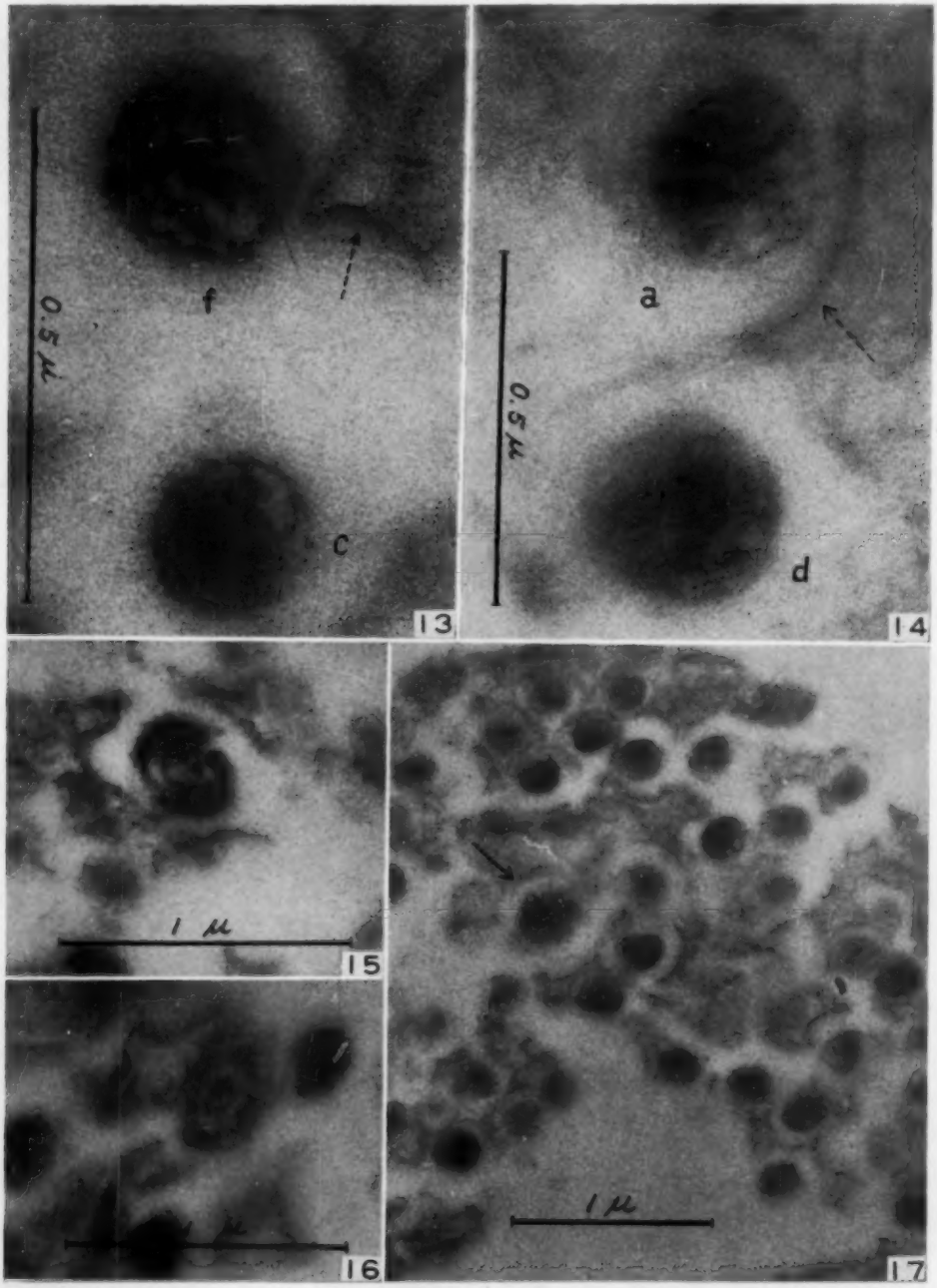
(Fig. 4) Elementary bodies in a full-grown inclusion. All of the elementary bodies have been enveloped. There is an envelope without an elementary body inside (em). (×44,000.)



Figs. 5 to 8 (Mitsui, et al.). Findings which suggest a development of elementary bodies from polygons by a spiral condensation in early stage inclusions. The spiral figure is indicated by "v." See Figure 18. (×46,800.)



Figs. 9 to 12 (Mitsui, et al.). Fine structure of elementary bodies in an early stage inclusion. Alphabetical references correspond to the findings in Figure 19. Solid arrows indicate developing elementary bodies. Dotted arrows indicate polygon membrane. (×154,000.)



Figs. 13 to 17 (Mitsui, et al.). (Figs. 13 and 14) Fine structure of elementary bodies from an early stage inclusion (fig. 13) and full-grown inclusion (fig. 14). In "f" of Figure 13, the spiral structure is obvious. (Fig. 13, ×154,000; fig. 14, ×110,000.)

(Figs. 15 and 16) Findings presumed to be initial bodies in "elementary body inclusions." They are larger than elementary bodies. A double-ring structure as well as a spiral structure is obvious. (fig. 15, ×45,500; fig. 16, ×44,000.)

(Fig. 17) A representative finding of the enveloping process of elementary bodies by the polygons. Arrow indicates an initial body-sized corpuscle. (×31,200.)

ture. In early stage inclusions, the polygons are abundant, with scanty elementary bodies. The elementary bodies seem to be produced from polygons by a condensation or similar process of them.

The present study gave us more convincing evidence for this postulate. As seen in Figure 2, the polygons seem to consist of three components—polygon membrane, polygon granules, and polygon ground substance. Most of the polygons are bordered by a dull membrane. The membrane has an unequal thickness and it shows a thickening at various portions of the wall, particularly corresponding to "indentations" (see later). Inside the membrane, there are minute granules. The granules are as small as 10 mμ or less in some polygons (fig. 2) and as large as 20 mμ or more in some others (figs. 5 to 8). They seem to be embedded in a homogeneous ground substance. The number of the granules varies greatly according to the polygons. Some polygons are filled with granules, while some others have scanty granules. In some polygons, granules can even be unrecognizable. It seems likely that polygon membrane becomes obscure when the polygon is filled with granules.

Many of the viral corpuscles in early stage inclusions give an impression of developing from the polygons, as indicated by solid arrows in Figure 2. Figures 5 through 8 illustrate representative findings of this kind.

The actual process of virus formation is obscure but, in many cases, it looks as if a peninsula is first formed from a polygon. Then the peninsula elongates, forming spiral or vortex figures, as illustrated in Figure 18. The vortex formation may be suggested by the findings indicated by "v" in Figure 2 and Figures 5 to 8. It may also be suggested by a trace of vortex structure in many of the grown viral corpuscles, particularly in those of Figures 13 and 15.

Nature of the membrane sphere

In the previous report, it was shown that the viral corpuscles (200 to 350 mμ in diameter) very often have a surrounding membrane sphere or an envelope (400 to 500 mμ in diameter). The membrane is thin in most cases and is very often incomplete, giving

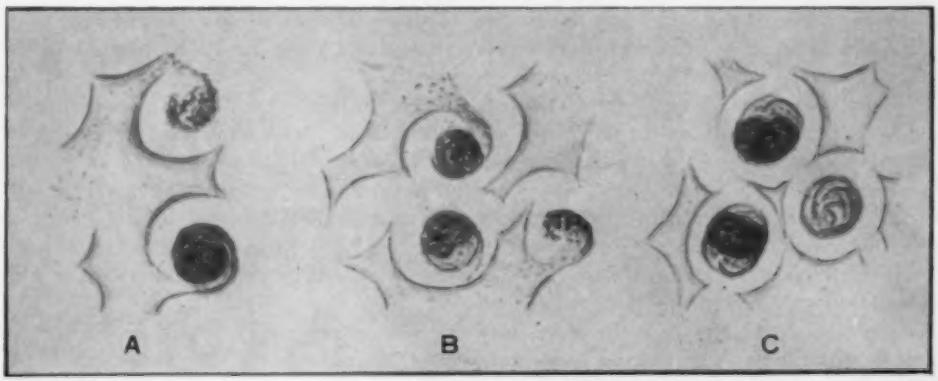


Fig. 18 (Mitsui, et al.). Schematic diagram of postulated "elementary body formation from vegetative form" and the "enveloping process."

(A) *The earliest stage.* A peninsula is formed from the polygon and continues elongation, resulting in a spiral condensation.

(B) *Advanced stage.* One of the new-grown elementary bodies is being discharged from the polygon. Two others are in process of development. Polygons are encircling the viral corpuscles, forming indentations and thickening on the wall facing the viral corpuscles.

(C) *Final stage.* Elementary bodies are fully developed. They have been entirely enveloped by the remaining polygons.

the appearance of a broken membrane.

The present study seems to elucidate the nature of the development of this envelope. In all probability, the envelope is the polygon membrane itself.

As seen in Figure 2, the polygons are likely to encircle the viral corpuscles, forming indentations on the surface facing the viral corpuscles, as indicated by dotted arrows. With time, the indented surface of the polygons approaches the viral corpuscles and, finally, the corpuscles are entirely enveloped by the polygons, in the manner schematically illustrated in Figure 18. Then the polygon membrane looks like a membrane sphere surrounding the viral corpuscles.

The actual process of enveloping is clearly seen in Figures 2, 3, and 4. Figure 17, which is a part of Figure 3, shows a representative finding, illustrating the process of envelope formation.

The developmental course of the envelope can explain why it is incomplete to show a broken membrane. The envelope is composed of the membranes of several polygons (they might be several processes of the same polygon when seen in three dimensions). Thus a discontinuation of the membrane, which can clearly be seen in most of the present pictures, occurs at the joint of two polygons.

From these facts, it may be assumed that viral corpuscles without an envelope are younger than those with it. Viral elements in early stage inclusions are likely to be bare (fig. 2), while those in developed inclusions usually have the envelope (figs. 4 and 17).

It might be said also that the envelope belongs to the interstitial substance rather than to the viral corpuscles and, therefore, may not be regarded as a part of the elementary bodies; though the interstitial substance itself may be part of the vegetative form of the trachoma virus.

An empty membrane sphere, as "em" in Figure 4, which was regarded as a kind of elementary body in the previous report, may be the envelope of a polygon membrane without viral corpuscles inside. Therefore, it may not be included in the conception of the elementary body.

Morphology of elementary bodies

The corpuscles, 200 to 350 mμ in diameter, may be regarded as the elementary bodies of the trachoma virus regardless of the presence or absence of the envelope. In the present pictures, most of the elementary bodies in early stage inclusions have a size of 200 to 250 mμ; and those in fully developed inclusions, a size of 250 to 300 mμ.

The elementary bodies do not seem to be solid granules but they do seem to have a fine structure. Figures 9 through 14 illustrate representative findings of elementary bodies at high magnifications. They appear full of varieties. However, we can imagine a sphere, the equatorial portion of which contains a dense granular substance with low-density polar zones. From the equatorial dense zone of the sphere, minute granular processes penetrate into the polar less dense zones. All of these substances in the sphere have a tendency to arrange themselves into a spiral or vortex structure (fig. 19). Most of the section findings of the elementary bodies illustrated herein may be explained as sections in various directions of this imaginary sphere.

The a, b, c, d, e, f, and g in Figure 19 are some of the representative findings of the imaginary sphere on sectioning in various directions. The actual findings of the elementary bodies indicated by the letters in Figures 9 to 14 may correspond to the findings indicated by the same character in Figure 19.

The corpuscles illustrated in Figures 15 and 16 are larger in size, measuring 350 to 450 mμ. They may be, therefore, the initial bodies by an ordinary microscope. Many similar findings can also be seen in Figure 3, as indicated by arrows. The corpuscles have a double-ring structure and an obscure boundary, as compared with elementary bodies. They present the intermediate appearance between the polygons and ele-

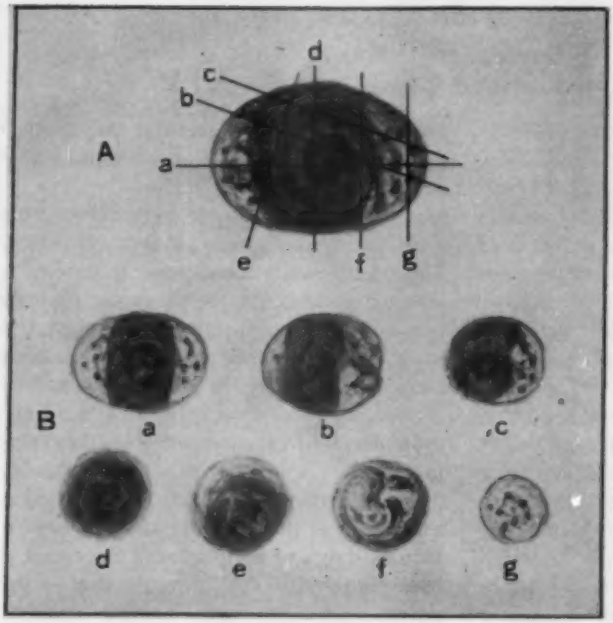


Fig. 19, Postulated fine structure of the elementary body.

(A) *Diagram in three dimensions.* There is a dense and granular equatorial zone with low density polar zones. Minute granular processes of the equatorial zone penetrate into the polar zones. There is a spiral arrangement of the components.

(B) *Diagram in sections.* Alphabetical references indicate the direction of the section shown by the same characters in diagram A respectively.

mentary bodies. It is probable that they are produced by "spiral condensation" of the polygons, as clearly indicated in Figure 15.

Not all of the larger corpuscles have such a structure. There are some corpuscles the size of initial bodies which have a structure similar to the elementary bodies, as indicated by an arrow in Figure 17.

The problem of pure initial body inclusions seems to require a separate paper and will not be discussed in the present paper.

Summary and Conclusions

This is a study of the fine structures of the trachoma virus in thin sections, as observed by a high resolution electron microscope. Some of the findings and explanations described in the previous paper[1] are confirmed and some others are corrected. Some new findings are also presented.

The presence of a vegetative form in the life cycle of trachoma virus seems probable. The envelope surrounding the elementary bodies previously reported seems to be the remains of the vegetative form and is usually found in mature elementary bodies.

The elementary bodies are the corpuscles of 200 to 350 mμ in diameter. They seem to be spheres with dense and granular equatorial zones and low density polar zones. They seem to have a vortex structure, as if they have developed by spiral condensation of the vegetative form.

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CROSS-SCOTOMAS IN OPTIC NEURITIS*

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In using the term, optic neuritis, Duke-Elder[1] means to include the intraocular form, that is, papillitis, as well as retrobulbar neuritis in which no fundus change is shown. It is well known that the visual field defect is of importance in diagnosing optic neuritis, especially retrobulbar neuritis. The accepted teaching is that the typical field defect in the disease is a central or cecocentral scotoma, although paracentral defects and involvement of the periphery occur rather infrequently as compared with the central defect. Chamlin[2] divided the visual field defects in optic neuritis as including both the intraocular variety (papillitis) and the retrobulbar variety (retrobulbar neuritis) into five classes: (1) Cecocentral defects; (2) paracentral nerve-fiber bundle defects: (3) paracentral nerve-fiber bundle defects; (3) para to the periphery; (4) nerve-fiber bundle defects involving fixation and periphery; and (5) peripheral defects only.

I also investigated visual field defects in optic neuritis by means of campimetry and the flicker-test, finding in a number of cases a new type of scotoma which did not belong to any group of Chamlin's classification. In recent years I have continually been aware that the occurrence of these supposedly uncommon defects is not quite as infrequent as was previously thought. The purpose of the present paper is to describe cases with such scotomas and to insert an additional group into Chamlin's classification.

MATERIAL AND METHOD

The cases presented here were seen at the Department of Ophthalmology, Kanazawa University, between the years 1950 and 1953. These cases were chosen only because the available clinical material was adequate enough to warrant a reasonably safe diagnosis of optic neuritis and also because visual field studies were satisfactory enough to permit definite conclusions to be drawn from them during our longer observation period. The ocular media were clear. In case of a reasonable doubt of the diagnosis of optic neuritis, the material was not included in this study. In those cases in which multiple attacks occurred, only the initial attack was described, and subsequent attacks were not utilized as separate cases, nor were they made use of as a study in visual fields. An important aspect of the data, as presented in this paper, is that the patients were seen in various stages of the disease. This should be borne in mind in evaluating the data of this paper.

The scotometry used belongs in principle to Bjerrum. The method consists in the use of a large black tangent screen held at a distance of one meter in front of the eye. A white test-object subtending 0.57 degrees in diameter was used. The central field examined covered a small area containing the macula, the optic-nerve entrance, and a restricted zone of the retina within a 20-degree circle. Some patients required correction for refractive errors. In these circumstances, the errors were corrected by glasses throughout the examination.

First of all, the position and size of the blindspot were recorded because it is an important landmark. For scotoma, first the macula, then the paracentral zone should be examined. In order to recognize and accurately record smaller or less severe scotoma, some care should be taken as to the direction of the test object. If care be taken to move the test object in such a way that it enters the defect at right angles to its border, the patient will be able to respond more definitely. Smaller or less severe defects can therefore be detected.

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Results

I (1950, unpublished) found that, in the flicker test in cases of retrobulbar neuritis, a considerable reduction in critical fusion frequency of flicker could be demonstrated, not only on the central area of the visual field involved but also not infrequently on the vertical and horizontal meridians of the field.

Therefore, I carefully examined the visual fields of these cases and found a horizontal and very often a vertical linear, relative scotoma as an elongation of the central scotoma. Such a scotoma was present in 40 cases of optic neuritis, most of which were those of retrobulbar neuritis. Three typical examples of the cases—K.M. (female, aged 14 years), K. S. (male, aged 51 years), and M. K. (male, aged nine years)—are shown in Figure 1. Two of them (M. K. and K. M.) showed the acute type of retrobulbar neuritis, the remaining case being of chronic type.

They were all ophthalmoscopically emmetropic, their visual acuity ranging from 0.06 to 0.7 at the time of examination. As can be seen from Figure 1, it is a feature common to all cases that the scotoma, besides the cecocentral defect, consists of two main portions, that is, a horizontal linear, relative defect and a vertical one as an enlongation of the cecocentral scotoma.

No scotoma of this type has been reported and none can be found in any group of Chamlin's classification. The scotoma, therefore, may be tenatively called "cross-scotoma," because of its similarity in shape to a cross.

It seems difficult to attribute this finding either to so-called Trexler's phenomenon[8] or to mere chance, because I not only could demonstrate a reduction in the critical fusion frequency of flicker on the area corresponding to the scotoma but also saw 32 other cases in which the cross-shaped defect in the visual field disappeared according to the improvement of the disease during the observation period. Two such cases (A. S. and K. T.) are given in Figures 2 and 3.

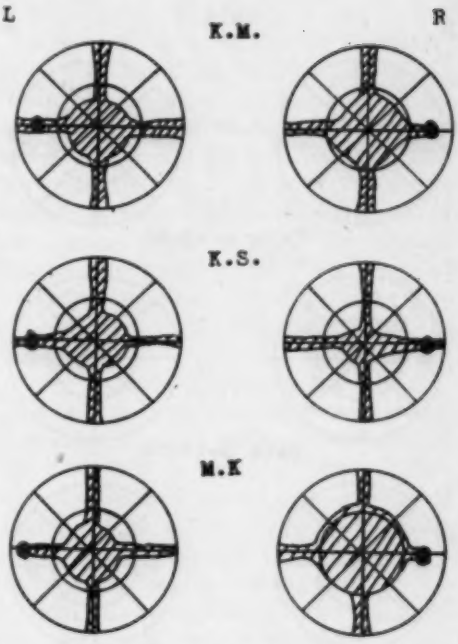

Fig. 1 (Yonemura). Cross-scotomas in retrobulbar neuritis. (Data of three patients are presented.)

In the case of Patient A. S. (male, aged 21 years), showing a slight congestion of the disc, a typical cross-scotoma was detected at the stage at which he began to complain of a marked loss of vision; his visual acuity in the right and left eyes was decreased to 0.06 and 0.03 respectively (upper set, fig. 2). Sixteen days later the horizontal and vertical relative defects had almost disappeared, a cecocentral scotoma alone being left (middle set, fig. 2). The examination on the 36th day showed only a smaller central scotoma associated with increased visual acuity; his visual acuity in the right and left eyes had increased to 0.1 and 0.04, respectively (lower set, fig. 4).

A similar case is given in Figure 3. At the first examination Patient K. T. (female, aged 22 years) exhibited a cross-scotoma, her visual acuity being reduced to 0.03 for both eyes (5-7-51, fig. 3). As can be seen in 5-13-51 (fig. 3), the defective area in the

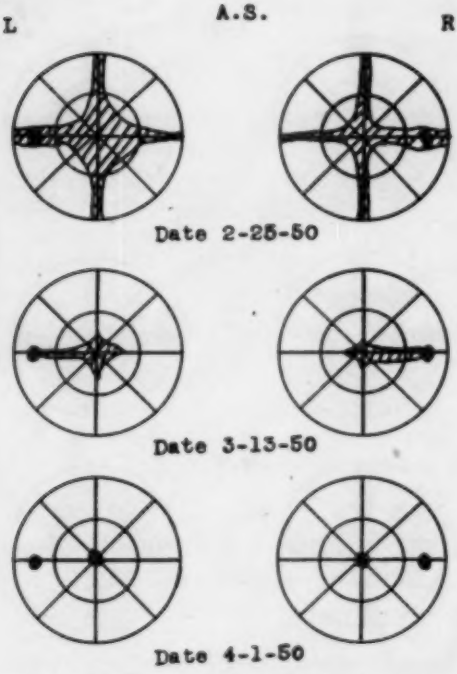

Fig. 2 (Yonemura). Visual field changes of Patient A. S. (Explanation in text.)

visual field diminished gradually almost to lose the vertical branch in six days. Thereafter, the visual field defect continued to contract and to change in shape, until it was transformed into a cecocentral scotoma (5-19-51, fig. 3) which was followed by a small central scotoma associated with an improvement of her clinical symptoms on the 70th day after the first examination; her visual acuity had increased to 0.3 in both eyes (7-15-51, fig. 3).

The "cross-scotoma" revealed in these cases can be ascribed neither to refraction errors nor to translucent defects in the ocular media, because the patients, as mentioned above, were emmetropic and their eye media were clear.

On the other hand, it should be noted that the light reflected from the surface of the test object is, as a rule, more or less polarized, passing through the eye media, which have optical properties of anisotropic substances,[4-7] to stimulate the retina which is also optically anisotropic.[8] Accordingly we have to consider whether either the polarization of the stimulating light or the anisotropic tissues of the eye is able to be a factor in producing the cross-scotoma.

Concerning this problem, the following facts should be pointed out:

First, the rays of light passing through two crossed Nicol prisms, that is a polarizer and an analyzer, between which an anisotropic substance lies, will deliver an interference figure. For example, the basal uniaxial interference figure,[4] consisting of two isopters which are at right angles and intersect in the

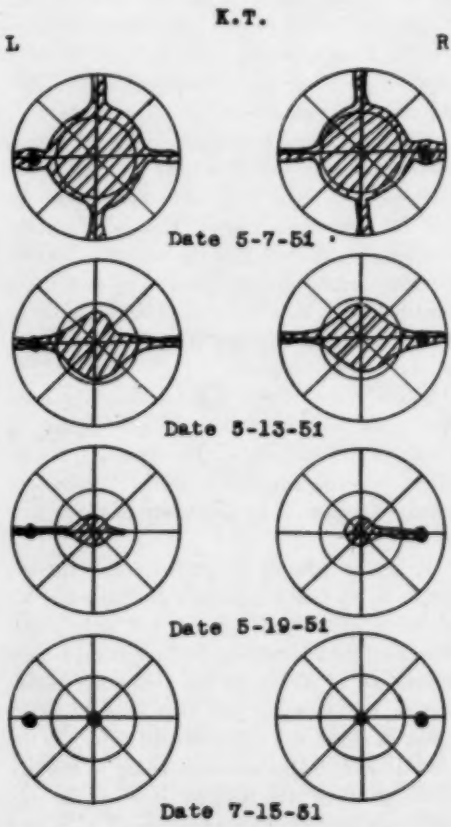

Fig. 3 (Yonemura). Visual field changes of Patient K. T. (Explanation in text.)

center of the field, seems to be closely similar in shape to the cross-scotoma.

Second, Haidinger's brushes,[9] observed when the rays of light polarized by a Nicol prism stimulate the retina, also should not be omitted, by reason of their bearing some resemblance in shape to the vertical branch of the cross-scotoma. Due to the fact that the cross-scotoma or the vertical branch is seemingly similar in shape to the isopters or Haidinger's brushes, respectively, it might be thought that the scotoma is developed by such an analogous mechanism as they, having a relation to the polarization of the stimulating light.

Such an interpretation, however, cannot be accepted for the following reasons:

It is established that, when the polarizer is rotated, the isopters, as well as Haidinger's brushes, will change. Thus, if the connection assumed between the cross-scotoma and either of the figures at issue were true, one would expect the scotoma to change with the rotation of the plane of the polarization of the simulating light issuing from the test object, the rotation being provided by monitoring a Nicol prism mounted in front of the eye.

In order to get information about the possible effect of the rotation upon the visual defects, the visual fields before and after mounting of the Nicol prism were compared in the case of the patient showing the cross-scotoma. But the mounting of the Nicol prism which changes the angle of the rotation was found to be ineffective in changing the shape of the scotoma at all angles. These findings are quite contrary to what was expected, indicating the foregoing assumption has no authoritative basis whatsoever.

Finally, it should also be mentioned that no case of a disease of the eye uncomplicated by optic neuritis was able to produce cross-scotomas, so far as could be discovered by examination. These data may be sufficient evidence for the assertion that so-called cross-scotomas belong exclusively to optic neuritis, in particular to retrobulbar neuritis.

Comment

It is widely accepted that the visual field defects in optic neuritis are caused by a functional or organic deterioration at the retinal level or the visual pathways behind the globe. The cross-scotoma, as stated in the preceding section, is closely connected with optic neuritis, and is independent not only of Trexler's phenomenon and the polarization of stimulating light but also of errors of refraction, opacities in the eye media, and other diseases of the eye uncomplicated by optic neuritis.

From these considerations, we may conclude that the cross-scotoma represents a discontinuity of visual fields corresponding to the horizontal and vertical meridians, the discontinuity being caused by a deteriorated function of the photo-receiving or conducting system corresponding to the horizontal and vertical meridional area in the visual field.

Even in a normal subject, a very slight imperfection or irregularity in the vertical meridional region in the visual field was reported. By means of a delicate technique Lancaster[10] presented the existence of a blind or insensitive "rift" or "hiatus," consisting of a very narrow vertical region whose breadth was found to be in the neighborhood of 10 to 20 minutes in arc. The rift extended from above and below the macula into the outer field of vision, presumably coincident with line of demarcation between the right- and left-hand halves of the retina as related to their cortical projections. Bair and Harley[11] found a midline notching in a number of intelligent co-operative subjects examined with a very small test-object of 0.057 degrees in visual angle, postulating a thinning of the medial border of each half-field based on Lancaster's conception.

It may now be indicated that the vertical axis of the cross-scotoma coincides with that of Lancaster's rift and the Bair-Harley notch, although the extent of the discontinuity of the visual field is far greater for the cross-scotoma than for the rift and notch. Hence, it is suggested that the vertical visual

defect of the scotoma has a close relation to Lancaster's rift and to the Bair-Harley notch.

It is also feasible to consider that the horizontal branch of the scotoma is related to a horizontal "raphe" formed by the meeting of the upper and lower paramacular fibers of Rönne,[12] because the raphe conforms to the meridional axis of the horizontal branch.

Such being the case, the tentative explanation for these features is:

It can be concluded that, in the case of optic neuritis, particularly retrobulbar neuritis, Lancaster's rift, Rönne's raphe, and their surrounding neighborhood not infrequently exhibit a likelihood of being involved, and that the visual field defects resulting from the involvement are nothing but the vertical and horizontal branches of the cross-scotoma seen in optic neuritis. Thus the representation of cross-scotoma in optic neuritis may be a pathologic evidence for Lancaster's and Rönne's conceptions.

Summary

In a flicker test in cases of optic neuritis, most of which were of retrobulbar neuritis, I found a considerable reduction in the critical fusion frequency of flicker on the vertical and horizontal meridians of the visual field. Therefore, I carefully examined the visual fields in these cases and found a horizontal and vertical, linear relative scotoma as an elongation of the central scotoma. I consider such a cross-scotoma to have a relation to the "discontinuity of the visual field" of Lancaster and to a "raphe formed by the meeting of the upper and lower paramacular fibers" of Rönne.

It is suggested that the representation of cross-scotoma in optic neuritis is a pathologic evidence for Lancaster's and Rönne's conceptions.

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Acknowledgments

I wish to express sincere appreciation to Prof. Y. Kurachi for his helpful criticism of this problem.

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PULMONARY COCCIDIOIDOMYCOSIS*

Associated with Jensen's disease

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Although mycotic infections of the eye are generally considered uncommon, several reports dealing with these diseases have appeared in the ophthalmic literature in recent years. Birge[1] in his excellent review on this subject has stated that most molds involve the external portion of the eye or its adnexa. However, a few cases of intraocular infection caused by various genera of fungi have been recorded. These have included the following: Aspergillus (Cogan[3]); Actinomyces (Harley and Wedding[5]); Blastomyces (Schwartz,[10] Cassady,[2] Sinskey,[11] and others); Cryptococcus (Weiss et al.,[13] and Wager and Calhoun[12]); Histoplasma (Day[4]); Monosporium (Pautler et al.[9]); and Coccidioides (Levitt,[7] Lovekin[6]). In so far as we can determine, none of these fungi have been incriminated as an etiologic agent in the production of Jensen's juxtapapillary chorioretinitis. The following discussion probably represents such a case caused by Coccidioides immitis.

Report of a case

History. The patient, a 19-year-old Negro soldier, was transferred to Brooke Army Hospital in April, 1956. He had entered the Army in September, 1955, and had never previously been outside of the state of Alabama. At the time of induction into the Army, chest X-ray films and eye examination were reported as normal. After 16 weeks of basic training in South Carolina and southwest Texas, followed by a two-week leave, he traveled by troop train through the southwestern United States to Los Angeles, and thence northward through the San Joaquin Valley to Seattle, Washington, where he arrived in the last week of February.

On March 7, 1956, he first noted diminished vision in the right eye. He did not seek medical attention until March 21st, after arrival in Alaska. At this time ophthalmoscopic examination and chest X-ray films were performed and the provisional diagnosis of malignant melanoma was made, whereupon the patient was evacuated to Brooke Army Hospital. There was no history of chills, fever, night sweats, cough, weight loss, pain, or other systemic symptoms. The only complaint was diminished vision in the right eye which had progressed slightly since the initial onset. Venereal disease was denied and the family history was negative.

Physical examination and ophthalmic findings. Temperature 98.6°F.; blood pressure 120/76 mm. Hg; pulse 76; respirations 14. The patient was a healthy, alert Negro in whom complete physical examination failed to reveal any abnormality except for the eye findings.

Visual acuity in the right eye was 20/50, J6, and in the left eye 20/20, J1. External examination, pupillary reactions, extraocular muscles, intraocular pressure, media, and left fundus were entirely normal.

The right fundus presented a striking picture (fig. 1). There was a patch of white exudate three disc diameters in size and elevated four diopters emerging from the lower portion of the disc. This patch of exudate had blurred margins and partially obscured the inferior vessels as they emerged from the disc. There was rather diffuse edema of the posterior retina and numerous tension lines could be observed extending toward the macula. Encircling the latter was a near-perfect macular star. There was no detachment and no inflammatory pigmenta-

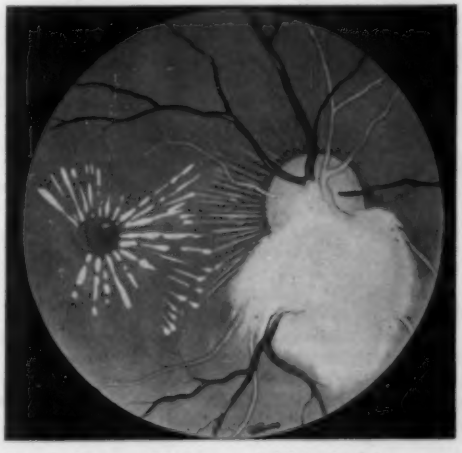

Fig. 1 (Brown, Hudson, and Nisbet). Appearance of fundus in March, 1956.

* From the Ophthalmology Service, Brooke Army Hospital.

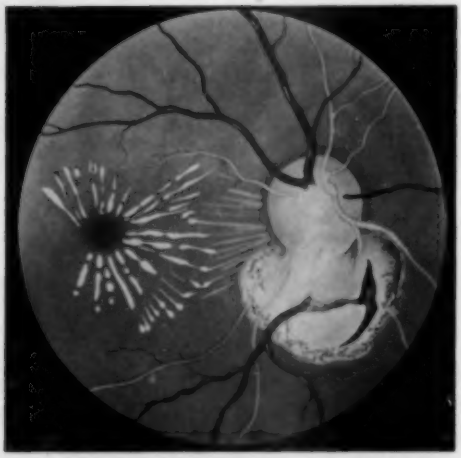

Fig. 2 (Brown, Hudson, and Nisbet). Appearance of fundus in July, 1956.

tion around the patch of exudate. Visual field examination showed an upper temporal quadrantic sector defect with its apex at the blindspot.

Laboratory data. Routine blood examination and urinalysis were within normal limits. Blood chemistries were entirely normal except for total protein of 8.1 gm. percent with A/G ratio of 3.9/4.2 gm. percent. Cardiolipin microflocculation (repeated twice) was negative; PPD first and second strength (0.00002 mg. and 0.005 mg) repeated twice was negative; histoplasmin (1:100 and 1:10) was negative; toxoplasmin skin test was negative; and coccidioidin first strength (1:1,000) was one-plus on two separate occasions; lymph node biopsy was normal.

Complete radiologic examination was negative except for the chest findings which, on April 21st, showed an area of infiltration radiating from the inferior portion of the left hilum to the left infraclavicular area. By April 27th the area of infiltration had cleared but there remained a soft tissue density at the superior pole of the left hilus.

Course. During the course of the patient's hospitalization he remained entirely asymptomatic except for diminished vision in the right eye. The ophthalmoscopic findings did not change except for a slight diminution in size of the patch of exudate, and early pigmentation about its margin. On June 15th, a thoracotomy was performed and frozen section of a left hilar node suggested coccidioidomycosis.

The left upper lobe was removed, and pathologic examination revealed multiple granulomatous lesions with some areas of caseous necrosis. Throughout these there were small round fungi with double refractile bodies containing endospores characteristic of Coccidioides immitis. Caseous material and fungi were also found in the adjacent bronchi.

The postoperative course was uneventful and follow-up ophthalmic examinations performed four months after the onset of the initial symptoms revealed that the juxtapapillary exudate had decreased to about two disc diameters in size and pigmentation about its margin had increased (fig. 2). The projections of the macular star appeared increased in length and the visual acuity had decreased to 20/200. The visual field remained unchanged.

Discussion

The diagnosis of chorioretinitis due to Coccidioides immitis in this patient must remain presumptive, since cultural and histologic studies were not obtainable. However, the usual tests for tuberculosis, syphilis, and sarcoid were negative and skin tests for histoplasmosis and toxoplasmosis were negative. In addition, there was no clinical justification for incriminating any other organisms (viruses, helminths, and so forth) as etiologic agents in this patient. Finally, the apparent simultaneous appearance of an ocular lesion with a pulmonary lesion subsequently proven to be due to C. immitis makes the circumstantial evidence quite convincing.

Woods,[14] in his recent exhaustive review, has pointed out that fungi produce a granulomatous uveitis and that in the few eyes studied histologically, Wilder and others have actually demonstrated mycotic organisms. Indeed, the lesion in our patient met the clinical criteria suggested by Woods for a granulomatous chorioretinitis. However, because of the accompanying diffuse edema and blurring of the neuroretinal margins, it is likely that there was a superimposed nongranulomatous reaction caused by hypersensitivity to the organism.

Our review of the literature reveals that two other cases of intraocular infection apparently due to Coccidioides immitis have been reported. In the first of these (Levitt[7]) a proliferative type of retinitis (unilateral) was observed in a soldier, aged 20 years, with active pulmonary coccidioidomycosis proven by sputum culture. The retinal lesion disappeared spontaneously over a period of 30 days with no trace of the previous ophthalmoscopic findings. In the second case

(Lovekin[8]) exudates, hemorrhages, and perivascular sheathing were noted in both ocular fundi of a 30-year-old woman with disseminated coccidioidomycosis confirmed by blood culture. Although the latter patient died, permission for pathologic examination of the eyes could not be obtained.

The etiology of Jensen's disease has recently been reviewed by Klien[6] who distinguishes two types. In one, the juxtapapillary chorioretinitis is apparently due to a hypertrophic granulomatous inflammatory reaction, most often of a tuberculous nature. There is no valid reason for separating these lesions from similar chorioretinitic foci elsewhere in the fundus. The other type (juxtapapillary chorioretinopathy) suggested by Klien is characterized by marked narrowing of the arterioles near the disc and thrombotic or spastic occlusion of the terminal branches. The case presently under discussion is obviously a Jensen's disease of the former type.

Treatment of coccidioidomycosis by drugs is notoriously ineffective. If an active focus of infection which is amenable to surgery can be found, operative removal is probably the treatment of choice. Although a definite decrease in size and activity of the chorioretinal lesion was noted in our patient, this cannot be attributed to the excision of the primary focus of infection since evidence of early resolution was ophthalmoscopically visible prior to lobectomy.

Summary

A new case of Jensen's juxtapapillary chorioretinitis associated with pulmonary coccidioidomycosis is reported and the reasons for relating the two lesions are discussed. The case is compared with two previously reported cases of intraocular inflammation apparently due to Coccidioides immitis.

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Acknowledgment

We are indebted to Mr. George Thomas for the fundus paintings.

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NOTES, CASES, INSTRUMENTS

BASAL-CELL CARCINOMA OF CYST OF MOLL

Report of a case

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Cysts of the glands of Moll are frequently seen on the lid margin of middle-aged persons; often more than one is present, usually near the inner canthus of the lower lid. Their origin is in the ductal part of the gland; however, occasionally the secretory part is implicated too.

The glands of Moll are apocrine sweat glands having a different mode of secretion and staining properties than the eccrine sweat glands of the skin. The epithelial lining of the secretory part of the gland of Moll stains eosinophilic, while that of the eccrine sweat gland is slightly basophilic. The secretory part of the gland of Moll is lined by a single layer of epithelium, in the duct two or three layers are present.

The duct usually opens into a pilosebaceous follicle with or without a cilia, occasionally, however, directly into the lid margin.

There is evidence (Duke-Elder[1]) that the cysts of Moll are not purely retention cysts. In some proliferative processes, they have been noted in the form of papillomatous formations of the epithelium.

Malignancy of the eccrine and the apocrine sweat glands on the lid margin (Moll) are rare. Zeeman[2] reported a case of a cyst of Moll in a 34-year-old woman in which at the first intervention the anterior wall was removed. When it recurred two years later, the posterior wall was excised too and it was cauterized with tincture of iodine. After an interval of two years an induration and a crust formation were noted at the former site of the cyst of Moll. This area was excised and the pathologic examination revealed epithelial tumor cells of malignant character having the appearance of the gland of Moll.

In the literature, the report by Arzt, cysts of the lids are quoted as malignant formations; however, perusal of the original paper convinces one that this interpretation is in error.

Because of the rarity of malignant tumors of the glands of Moll, the following case is of interest.

Case report

A 72-year-old white woman was seen in 1954 for the correction of a refractive error. A small cyst of Moll was noted on the lid-margin of the upper lid near the inner canthus. It was about two-mm. in diameter, well defined, and translucent. The preauricular gland was not palpable. No skin tumors were present elsewhere in that region. Family history and personal history were negative.

A few weeks later the patient returned because she believed the nodule on the upper lid had increased in size. The examination revealed that the cyst on the right upper lid margin had increased in size only slightly but its appearance had changed in character. It was still well defined but it had become opaque and a dimpling was apparent in its center. The preauricular gland was not palpable.

The little tumor was excised. Grossly, it showed a well-defined ovoid tumor about three mm. in diameter. Microscopic examination revealed the

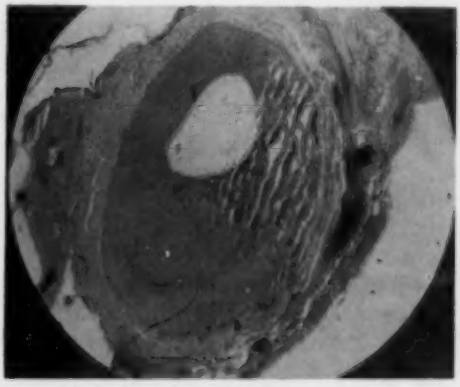

Fig. 1 (Weizenblatt). Photomicrograph of basal-cell carcinoma of cyst of Moll. No extension or connection with skin or adnexal structures. To right and left, hair follicles with sebaceous gland (×50).

specimen to be barely two-mm. long and 1.7-mm. in its transverse diameter. On top it was covered by normal stratified epithelium. Beneath it was a thin layer of connective tissue which continued ringlike around the tumor. The latter was ovoid in shape, 1.5 mm. in length and 0.9 mm. in width. It was composed of epithelial cells with large nuclei and scanty ill-defined cytoplasm which stained eosinophilic. At the lower half, the tumor was 0.7-mm. thick; at the top and sides, 0.21 mm.

The peripheral cell layer showed a palisading arrangement, in the rest of the tumor the cells were arranged haphazardly. They varied greatly in size and a few abnormal mitoses, as well as some multinucleated cells, were present. In the upper half of the tumor was a pear-shaped, well-defined cystic space, of 0.56 by 0.35 mm. It was filled with a granular, faintly eosinophilic substance.

On either side of the tumor, normal hair follicles, as well as a lanugo hair, were visible; on one side there was a sebaceous gland. No sweat glands were seen and there was no connection between these adnexal structures and the tumor. Nowhere was there any inflammatory reaction in the connective tissue around the tumor.

There has been no recurrence in the two-year period since the removal of the tumor.

Fig. 2 (Weizenblatt). Photomicrograph showing palisading of cells at base, abnormal mitoses, granular material in cystic space (×350).

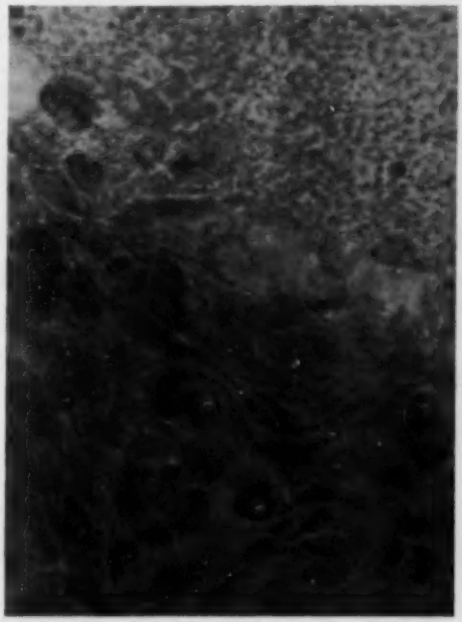

Fig. 3 (Weizenblatt). Photomicrograph, showing multinuclear tumor cells near cystic space (×860).

Comment

Basal-cell carcinomas are very frequently observed on the lid margins and there are many theories as to their origin. Some authors (Lever[4]) believe that these carcinomas develop from the adnexal structures, namely the basal cells of the sebaceous glands, the sweat glands, and hair follicles. Others assume that distorted adnexal primordia and not normal adnexa give rise to these tumors.

Hagedoorn[5] examined some cysts of the lid margins and cystic nodules of the skin of the lids. Histologically, there were under the surface, in addition to the cysts, epithelial rudimentary tubules and epithelial strands typical of congenital anomalies (hamartomas). His conclusions are that cysts of the lid margin are not due to an occlusion of a normal gland but arise in a congenitally abnormal region. This theory, however, cannot be well applied to the case herein reported, as no other anomalies were present on the lid or lid margin.

In the differential diagnosis of cystic basal-cell carcinoma of the skin and basal-cell carcinoma of a cyst of Moll the factors speaking for the latter diagnosis were:

The tumor, when first seen, was typical of a cyst of Moll in its appearance and its location. On pathologic examination the cystic space was surrounded by the many layers of tumor cells in nearly concentric arrangement. The cells bordering the cystic space did not show any vacuolation or foamy appearance. There was no connection between the tumor cells and the surface epithelium or the adnexal structures (sebaceous gland, hair follicles) near it.

It cannot be stated definitely, as a survey of the literature seems to indicate, that malignant degeneration of cysts of Moll is very rare because such cysts removed in the office frequently are not examined microscopically.

SUMMARY

A case of basal-cell carcinoma in a small cyst of Moll was observed in a 72-year-old woman. The tumor showed no extension beyond the cyst. No recurrence was noted during the two-year follow-up period. Malignant tumors of the apocrine glands of Moll and the eccrine sweat glands are rare.

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BLEPHAROCHALASIS IN UPPER EYELIDS

INCLUDING ITS CLASSIFICATION

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Since 1949 when the first plastic operations were done on upper eyelids for the correction of slit eyes and blepharoptosis, I have been struck by a pathologic condition of the eyelid called blepharochalasis, the surgical correction of which is similar to widening of slit eyes except for the additional step of excising an elliptical fold of skin which overhangs the lateral side of the upper eyelids.

A. *Blepharochalasis,* frequently observed in persons past middle age especially among the Orientals, is a condition not extensively discussed in the literature and textbooks. In the literature it is looked upon as an atrophic or degenerative process.

1. Newman Dorland[1] states that blepharochalasis is the relaxation of the skin of the eyelid due to atrophy of the intercellular tissue.

2. Berens and Zukerman[2] mention that, in blepharochalasis, the supratarsal fold of the skin of the upper eyelid becomes relaxed, thin, and wrinkled, extending down to and partly covering the border of the lower lid so that it presses the cilia against the eyeball.

3. Spaeth[3] writes that blepharochalasis is an atrophic degenerative condition of the skin of the upper eyelid where it lies about the orbitopalpebral fold. The condition may become so extreme that the lid margin overhangs the palpebral fissure. It is due to progressive atrophy of the epithelial and subepithelial layers. It is rather likely that the condition is originally allergic in nature, recurrent, and extends over a period of many years during which the patient at re-

peated intervals has an angioneuriticlike edema of both the upper and lower lids.

4. Duke-Elder[4] mentions that it is a condition characterized by atrophy and relaxation of the tissues of the upper lid following chronic and recurrent edema of anterior structures of the orbit.

B. *Present observations.* After having examined over 1,000 persons in annual physical check-ups of Philippine Army officers and in my limited private practice, I have observed that the condition can be found in different degrees and in different classes of eyes—those with superior palpebral folds and those without it. In the light of these anatomic observations, the following classification of blepharochalasis is presented.

CLASSIFICATION

I. *Eyelids with superior palpebral folds:*

1. *First degree.* The skin partly covers the fold on the lateral side.

2. *Second degree.* The skin not only covers the fold completely but also touches the eyelashes on the lateral third of the lid.

3. *Third degree.* The skin covers the lateral canthus or the palpebral commissure on the lateral side.

II. *Eyelids without superior palpebral folds* (slit eyes):

1. *First degree.* The skin covers the edge of the lid on the lateral side, thus pressing the eyelashes downward.

2. *Second degree.* The skin covers the lateral canthus.

3. *Third degree.* The skin covers the palpebral commissure on the lateral side or may even touch the lower lid.

C. *Effects of the different degrees of blepharochalasis.*

1. The cosmetic appearance suffers from all degrees of blepharochalasis.

2. The second degree of Classification I and the first degree of Classification II produce downward pressure on the eyelashes, which irritate the cornea and the bulbar conjunctiva.

3. The third degree of Classification I and the second and third degrees of Classification II produce narrowing of the visual field on the temporal side.

D. *Surgical techniques*

1. *In eyelids with superior palpebral folds,* one notices a horizontal line on the skin indicating the original height of the fold. In the reconstruction of the superior palpebral fold, the incision follows this line. Three to four intradermal interrupted sutures (6-0 black silk) are applied on the lower lip of the incised wound to the anterior surface of the tarsus. The elliptical piece of overhanging skin of the upper flap is excised. The lower lip of the wound is then sutured to the upper flap to include the skin, subcutaneous tissue, tarsus, and thence out through the skin. Enough interrupted sutures are placed to close the wound neatly.

2. *In eyelids without superior palpebral folds (slit eyes),* the technique comprises a plastic construction of the superior palpebral fold with the additional step of excising an elliptical piece of overhanging skin on the lateral side of the lid.[5]

E. *Observations.* In the past two years, a study has been made of the anatomic variations of the eyes of 20-year-old Filipino trainees and of Philippine Army officers during their annual physical examination. This was done in collaboration with Capt. Olimpio Hembrador (MC) P.A.T.C. In these surveys, the following observations have been made:

1. *Blepharochalasis* is fairly common in male Filipinos past middle age, increasing in proportion to advancing age.

2. It is more common in foldless slit eyes than in eyelids with the superior palpebral fold; hence, it is more common among Orientals.

3. Although surveys and observations were made mainly on Filipino males, it does not mean that the condition is not found in females. My feeling is that the incidence is just about the same for both sexes.

4. Persons with the condition usually consult a doctor for cosmetic reasons rather

than for disturbance of the temporal visual field.

5. Surgical correction of blepharochalasis is similar to the technique used for slit eyes except for one additional step—excision of the excess skin.

Headquarters,
Philippine Army Training Command.

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AQUEOUS-CARRYING VEINS ON SURFACE OF LENS CAPSULE*

Joseph E. Alfano, M.D., and Rimvydas Sidrys, M.D.
Chicago, Illinois

When present, aqueous-carrying veins can usually be found in or near the limbus, particularly on the nasal side, in the sclera, or in the episcleral tissues.[1]

The definition, occurrence, origin, appearance, classification, and other characteristics of these veins have been so well documented by Ascher[1-9] who first described them, that is would serve no purpose to re-enumerate them here.

Löhlein[10] (fig. 1) and Trantas[11] reported aqueous veins occurring in corneal scars. The first of these authors[10] speculated that this was evidence that aqueous veins did not arise from Schlemm's canal but instead they might represent a direct communication between the anterior chamber and the cornea. A survey of the literature reveals that, heretofore, aqueous-carrying veins have not been reported as occurring on the surface of the lens capsule.

Case reports

Case 1

History. The first case to be reported is that of a 54-year-old Negro who was admitted to the hospital for treatment of diabetic gangrene of the right foot. The patient was a known diabetic of 11 years' duration and was now controlled with 20 units of protamine zinc insulin daily. Blood pressure was recorded as 130/80 mm. Hg.

Eye findings. He was seen in the eye clinic because of failing vision in the right eye. He had lost the vision in the left eye rather suddenly about one year previous to his present admission. Visual acuity was 10/200 in the right eye, with questionable light perception in the left.

External examination of the right eye was normal except for a sluggish pupillary reaction and some cortical lens opacities. Fundus examination revealed a moderately severe diabetic retinopathy with retinitis proliferans. Ocular tension was 20 mm. Hg (Schiøtz).

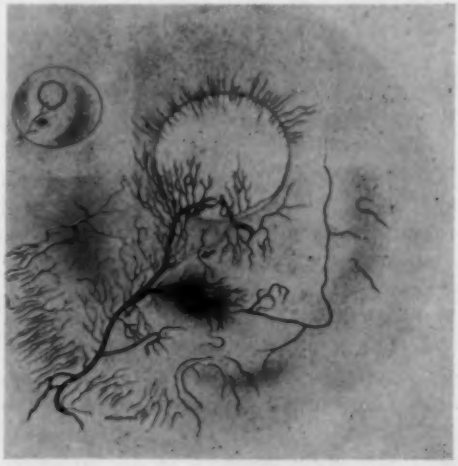

Fig. 1 (Alfano and Sidrys). Aqueous-carrying vein on surface of vascularized corneal graft. (After Löhlein, H. Klin. Monatsbl. f. Augenh., **119**:618-629, 1951.)

* From the Departments of Ophthalmology, Cook County Hospital and the Northwestern University Medical School.

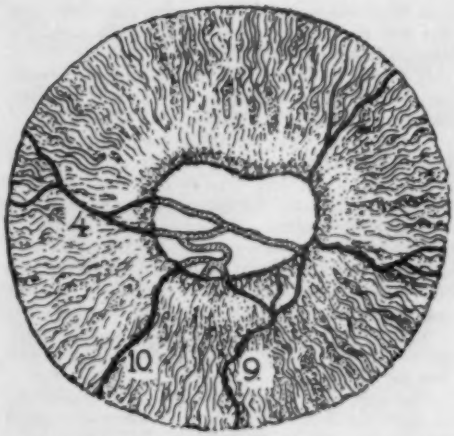

Fig. 2 (Alfano and Sidrys). Aqueous-carrying veins on surface of lens capsule with neovascularization of the iris.

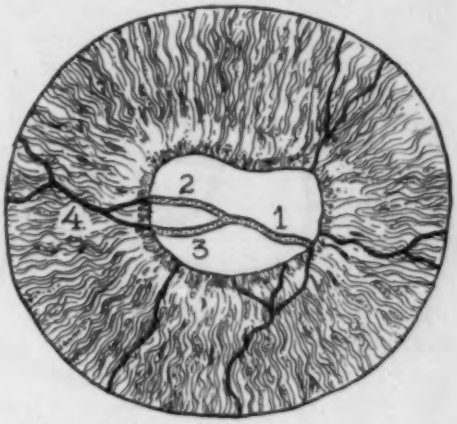

Fig. 3 (Alfano and Sidrys). Aqueous-carrying veins (numbered 1, 2, 3) on surface of lens capsule.

Examination of the left eye revealed a moderately severe conjunctival and episcleral injection. The cornea showed a moderate haze, and the pupil was semidilated and did not react to light.

Slitlamp examination revealed a deep anterior chamber with a moderately heavy flare and multiple floaters. The lens was completely opaque with a greenish hue. The iris and lens were vascularized, as shown in Figures 2, 3, and 4. Coursing on the surface of the lens capsule (fig. 2) was a system of vessels, apparently carrying aqueous, the description of which follows:

As shown in Figure 3, a mixed aqueous-carrying vein (1) began at the pupillary border at about the 4-o'clock position. From its point of origin, it passed horizontally toward the center of the pupillary space where it bifurcated into a superior branch (2) and an inferior branch (3). The superior branch passed horizontally toward the nasal pupillary border where at the 9-o'clock position it emptied into a larger recipient iris vessel. The aqueous column became lost after the aqueous-carrying vein emptied into the iris vessel. The inferior branch numbered 3 also passed horizontally to the nasal pupillary border, to empty into a larger iris vessel at the 8-o'clock position. The aqueous column could be seen for only a few millimeters after the vein had emptied into the iris vessel. The two recipient iris veins then united as shown in Figure 3 to form a single vessel (4). This vessel passed toward the angle at about the 8-o'clock position, where it bifurcated and both branches became lost in the angle.

As shown in Figure 4, another mixed aqueous-carrying vein (5) began at the pupillary border at about the 6:30-o'clock position and passed upward for about two mm., after which it bifurcated into a short lateral and a medial branch. The lateral branch then divided into an inferior division (7) and a superior division (8). The superior division passed upward toward the center of the pupil and joined with the aqueous vein numbered 3, Figure 3. The inferior division passed downward to the pupillary border of the iris and entered a larger iris vessel numbered 9 at almost the 6-o'clock position. The medial branch of aqueous vein numbered 6 passed inferiorly to reach the pupillary border at the 7-o'clock position, where it emptied into a recipient iris vessel numbered 10. This vessel passed into the angle at the 7-o'clock position where it became lost.

The iris vessels numbered 4, 9, and 10 all became lost in the angle. Unfortunately, due to haziness of

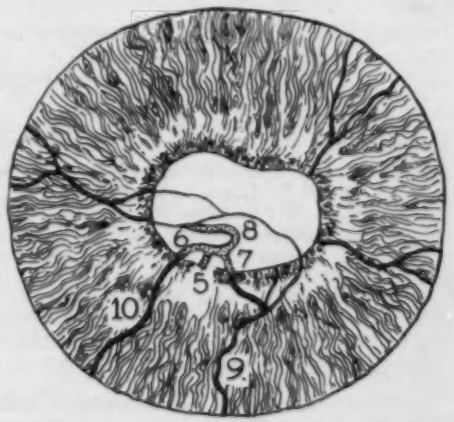

Fig. 4 (Alfano and Sidrys). Aqueous-carrying veins (numbered 5, 6, 7, 8) on surface of lens capsule.

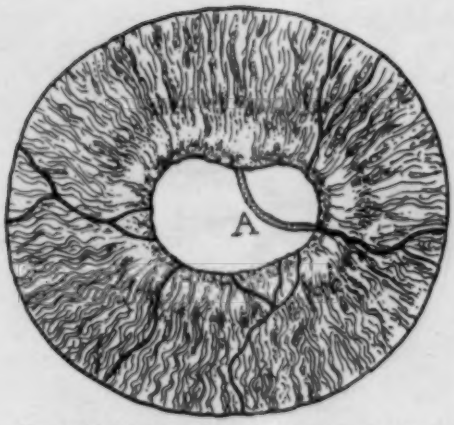

Fig. 5 (Alfano and Sidrys). Aqueous-carrying vein (lettered A) on surface of lens capsule.

the cornea and anterior chamber associated with the atrophic uveitis, details of the angle could not be discerned by gonioscopy.

In the episcleral tissues, on the nasal side from the 6- to the 11:30-o'clock positions, were many mixed aqueous veins similar to those seen on the lens capsule. At the 7o'clock position in the episclera at the site of the large iris vessel numbered 10, there was a large mixed aqueous vein. A similar vein could be seen in the episclera at the 9-o'clock position. No aqueous veins were visible at the limbus on the temporal side. This is interesting since, in the aqueous-carrying veins described on the lens capsule, the flow of aqueous was from the temporal side of the pupillary border toward the nasal portion of the angle.

CASE 2

History. Case 2 was that of a 75-year-old white man who was a diabetic of many years' duration and was now taking 30 units of insulin daily. He gave a history of poor vision in the left eye of four to five years' duration and a rapid deterioration of vision in the right eye during the four months previous to admission.

Eye findings. Vision, O.D., was light perception with faulty projection. There was no light perception in the left eye. In the right eye, the cornea was clear and the anterior chamber was deep and optically inactive. The pupil was 4.0 mm. in size and irregular, with no reaction to light.

There was a seclusion of the pupil and the lens was completely opaque. On the surface of the lens capsule originating at the 12-o'clock position was a mixed aqueous-carrying vein (A, fig. 5) which passed downward and nasally on the surface of the lens as shown.

The vein approached the nasal pupillary border at about the 3:30-o'clock position where it emptied into an iris vein as shown.

There was some neovascularization of the iris. Ocular tension was 20 mm. Hg (Schiøtz).

The left eye showed an absolute hemorrhagic glaucoma.

SUMMARY

Two cases are described in which what appeared to be mixed aqueous-carrying veins were found on the surface of the lens capsule. Both patients were diabetics and both showed, in addition, neovascularization of the iris.

Absolute verification of these vessels as aqueous-carrying structures must necessarily rely upon analysis of the content of the individual vessel.

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MYDRIATIC GLAUCOMA

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AND
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New York

This paper will report three cases in which acute glaucoma was precipitated by instillation of drugs which are considered relatively safe: one by cyclopentolate hydrochloride (Cyclogyl), 0.5 percent, another by ephedrine sulfate three percent, and the third by paredrine hydrobromide, one percent.

Dilatation of the pupils from any cause may precipitate acute glaucoma. The darkness test for glaucoma is based on this. Atropine and homatropine are well known as agents that may bring on attacks of acute glaucoma; less well known is the fact that even the mildest mydriatics, for example, paredrine hydrobromide and ephedrine sulfate, can precipitate acute glaucoma. Cyclogyl was given its first clinical trials at Montefiore Hospital.[1] Since then, it has been used routinely for cycloplegic refractions. This is the first case we know of in which it caused acute glaucoma.

Ophthalmologists generally follow the dilatation of the pupil with a miotic drug. Though this certainly must prevent trouble in many cases, it is not an infallible measure.

CASE REPORTS

CASE 1

C. L., a man, aged 71 years, was examined at the Montefiore Hospital Eye Clinic on May 26, 1955. He was a diabetic of 25 years' duration, taking 55 units of insulin daily. Both eyes appeared normal and the pupils were round, regular, and equal. The ocular tension in both eyes was within normal limits to the fingers. In order to examine the fundi the examiner instilled one drop of one-half percent Cyclogyl in both eyes. The pupils dilated well and diabetic retinopathy of moderate severity was noted. There was no note on the chart of subsequent instillation of a miotic, though that is the standard practice at this hospital.

The patient returned on the following day. His vision had been blurred following the examination but he was quite comfortable when he went to sleep. When he awakened the next morning, there was severe pain in the left eye and in the forehead above, and he was nauseated. During the day the pain continued and he vomited several times.

Ocular examination revealed a fixed dilated left pupil, a steamy cornea, and a shallow anterior chamber. The ocular tension was 17 mm. Hg in the right eye, and 49 mm. Hg in the left eye (Schiøtz).

The acute attack subsided in about one hour following the instillations of eserine salicylate (0.25 percent) and pilocarpine hydrochloride (two percent) every 15 minutes. The next morning the tension was 14 mm. Hg in the right eye and 11 mm. Hg in the left eye. There was no reduction in visual acuity, and the eyes were not injected. The patient was comfortable.

CASE 2

R. S., a woman, aged 60 years, had been under the observation of one of us for three years for chronic simple glaucoma. Tension had varied from 18 to 30 mm. Hg (Schiøtz) while under observation and under continuous treatment with pilocarpine. The right eye had always been amblyopic and there was a small degree of right convergent strabismus. Fields of vision showed a moderate upper nasal constriction in the right eye and a full field in the left eye. At the first visit the best correction with lenses was 20/100 in the right eye (+7.0D. sph. $\bigcirc$ +1.0D. cyl. ax. 75°) and 20/40 in the left eye (+7.0D. sph. $\bigcirc$ +1.5D. cyl. ax. 105°).

After three years, vision with glasses in the left eye had dropped to 20/50. In order that a more complete funduscopic study be made, the patient was instructed to omit pilocarpine eyedrops before her next office visit. However, when she arrived at the

office, the pupils were still miotic and ephedrine sulfate (three percent) was instilled in both eyes. This permitted an examination which disclosed some lens opacities, a very shallow excavation of the right disc, and a normal left disc. Pilocarpine hydrochloride (two percent) was instilled following the examination. That night the patient had an acute attack of glaucoma in the right eye which resisted all medical treatment, so that an operation had to be performed. The operation was uneventful and the eye healed well.

Case 3

J. S., a man, aged 72 years, had an acute attack of glaucoma in the right eye in August, 1951. Several weeks later a peripheral iridectomy of the right eye was performed. The vision in the right eye was poor thereafter, but there was no recurrence of increased tension in this eye. The patient used pilocarpine hydrochloride (one percent, every four hours through the day) in both eyes from 1951 until May, 1955, when he presented himself for examination.

The tension was 21 mm. Hg (Schiøtz) in each eye. The right pupil was slightly dilated and irregularly oval, and there was a peripheral iridectomy above. Both eyes were pale. The right fundus was not visible through dense lens opacities. The left eye showed a miotic pupil (pilocarpine effect), a shallow anterior chamber and a narrow angle. The left pupil was dilated with paredrine hydrobromide (one percent). Normal fundus detail was hazily discerned through a still small pupil and an immature cataract. The best vision with correction in the right eye was 20/400 and in the left eye 20/60. The patient had no distress after this examination, and he continued for the next three months to use pilocarpine hydrochloride 4 times a day in both eyes.

He presented himself for re-examination August 12, 1955, when the vision in each eye was unchanged, the tension in the right eye was 16 mm. Hg (Schiøtz) and in the left eye 19 mm. Hg. Paredrine hydrobromide (one percent) again was instilled in the left eye for the examination. Pilocarpine hydrochloride (two percent) was instilled after the examination.

The next morning, the patient awoke with a severe glaucoma of the left eye, with a widely dilated and fixed pupil, a steamy cornea, pain and vomiting, and ocular tension of 62 mm. Hg (Schiøtz). The right eye was unchanged from the appearance of the previous day. Despite intensive miotic therapy and 500 mg. of Diamox, followed by 250 mg. at six-hour intervals for two subsequent doses, the acute attack did not abate. An iridectomy ab externo was performed, with a satisfactory postoperative course.

Summary

1. Three cases of acute glaucoma are presented, which were precipitated by the instillation of mydriatics considered relatively safe.

2. There is no completely safe mydriatic; even the mildest mydriatic may precipitate an attack of acute glaucoma in an eye in which the anatomic and physiologic pattern predisposes to this catastrophy.

1749 Grand Concourse.

2625 Grand Concourse.

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SOCIETY PROCEEDINGS

Edited by DONALD J. LYLE, M.D.

YALE UNIVERSITY CLINICAL CONFERENCE

January 27, 1956

DR. R. M. FASANELLA, *presiding*

CASE PRESENTATIONS

CASE 1: JUXTAPAPILLARY NEURORETINITIS

DR. VAN LONKHUYZEN presented the history of a 15-year-old white boy, who was admitted to the hospital on November 21, 1955, with marked blurring of the optic disc of the left eye. One year prior to admission, the patient had a convulsion, the first one in his life, which was followed by several others and was apparently brought under control with Dilantin. The patient had an abnormal electroencephalogram, showing a questionable focus on the right side. Two weeks prior to admission, the patient began to complain of a moderate to severe headache. He was admitted to the hospital to rule out brain tumor.

On admission the essential findings were: Mental retardation with several previously recorded IQs ranging from 49 to 61. There were no positive neurologic findings.

The eye findings included normal extraocular muscle function without nystagmus. The pupils were normal and reacted equally to light. The right disc was normal but the left one showed marked blurring of the entire disc and whitish exudates in the perimacular area in a typical star pattern.

Visual fields, which on admission were unreliable because of the mental status, were consistent in showing a pie-shaped cut on the entire lower nasal quadrant of about 120 degrees beginning at the horizontal raphé. It became apparent that this field had a narrow bridge of extension to the blindspot which was otherwise normal. A lumbar puncture was negative.

The patient was treated with Meticorten and as the process surrounding the disc and the disc margin cleared, it became evident that there was a focus of inflammation on or just adjacent to the superior margin of the disc. The final diagnosis was juxtapapillary neuroretinitis.

Discussion. DR. FRANCIS P. GUIDA noted that this case was an interesting one with a history suggestive of brain tumor with a rather unusual outcome.

DR. FREEMAN: The characteristic of the visual loss occurring here suggested a diagnosis of papillitis or neuroretinitis rather than papilledema.

DR. GUIDA: It is still not possible to rule out the papilledema on that basis. This type of visual loss and a macular star can both occur with papilledema. However, a demarcated nerve bundle defect noted on the visual field suggests a lesion off the disc.

CASE 2: RETROBULBAR HEMORRHAGE

This was the case of a 17-year-old white boy who was admitted with a history of trauma to the eye 18 hours previously. At that time, while bending over, the patient struck his right eye against a hook on a clothes rack, with almost immediate loss of vision to perception of only dark shadows against a light background.

On admission the eye showed a very slight abrasion of the right upper lid, moderately sized subconjunctival hemorrhage on the lateral side. The pupil was fixed and dilated. The fundus showed large, fairly well-outlined grayish patches in the extreme lateral periphery. No definite choroidal tear could be seen. The macula, disc, and remainder of the retina were all within normal limits, except for a slight engorgement of the retinal vessels. The patient denied any central vision and had finger counting at three feet in the temporal peripheral field only.

Two days after admission, the patient denied any vision in the eye in any direction, even seeing a bright light. He was treated with atropine and bedrest. At the end of one week, vision started to return slowly and pigmentary deposits were becoming evident in the involved gray peripheral area.

Five weeks after the injury, the patient had regained his vision except for a cut in the nasal field corresponding to the retinal involvement and for a dense central scotoma of about 15 degrees. By this time, the disc of the right eye was definitely much paler than the disc of the left eye.

Discussion. DR. FREEMAN: I believe that the choroid was not ruptured but that this represented considerable chorioretinal edema.

DR. E. ROSENTHAL: It was interesting that heavy pigmentation was seen in two weeks. I feel that this may be indicative of a hemorrhage deep in the choroid.

DR. GUIDA: On the first day, the reaction was very limited in the temporal area. To me it was amazing that this progressed to severe loss shortly thereafter.

DR. FREEMAN: One of the explanations might be that the circle of Zinn was affected, resulting in optic nerve damage.

DR. ZUCKERMAN: In what way could the optic nerve be affected so as to cause only damage to the macular fibers?

DR. W. GLASS: It has long been considered that there is a differential sensitivity of fibers in the optic nerve in that the macular fibers are more sensitive to traumatic damage than the others.

DR. CLARKE: With all the reaction around the periphery, why couldn't the injury have affected the macular retinal area selectively?

DR. GLASS: I should expect many more pathologic ophthalmoscopic findings in the macula if the visual loss were due directly to macular damage. I don't believe this is commotio retinae.

DR. CLARKE: A concept of partial or simulated avulsion is very suggestive here. The disc is getting whiter week by week. Retrobulbar hemorrhage with pressure on the nerve from a direct injury to the globe may explain this case.

CASE 3: PITUITARY CHROMOPHOBE

DR. FREDERICK E. MOTT presented a married white woman, aged 48 years, who was seen at the office on May 15, 1954. Two years before she first became aware of some difficulty with her vision and consulted an ophthalmologist in Omaha, Nebraska, who prescribed glasses. She was unaware of any further change in her visual acuity until about one year ago, when, upon checking her vision once again, she had considerable difficulty in distance vision, using the right eye. A change in glasses was made and she continued that year without being aware of any significant change until approximately three months before when she noted a sensation of constriction of the visual fields described as closing in from the sides. The patient had no other ocular or systemic complaint.

Examination showed her vision in the right eye was finger counting at six feet, unimprovable with lenses. The left eye corrected to 20/40. The discs were pale, the left being more so than the right. Peripheral fields were performed which showed definite constriction. X-ray examination showed enlargement of the sella turcica.

Operation was performed on May 26, 1954, and a large chromophobe tumor of the pituitary was removed. The right optic nerve had been flattened by compression of the tumor. The patient made an uneventful recovery. On June 15, 1954, corrected vision in the right eye was still limited to finger counting at six feet, while vision in the left eye was 20/25−2. The peripheral field was essentially unchanged.

The patient was examined at monthly intervals, with vision improving slightly and peripheral fields remaining essentially unchanged. The patient was asked to return in three months. On June 15, 1955, the patient stated that she thought her eyes were

staying the same. However, vision in the right eye was reduced to light perception and the vision in the left eye was 20/20. The field in the right eye had almost completely disappeared, while that of the left was unchanged.

X-ray therapy was advised by her neurosurgeon. Vision in the left eye continued to deteriorate and on August 16, 1955, her vision in the left eye was 20/60. Soon after that, a second operation was performed for a recurrence of the original brain tumor. The patient withstood the operation well but vision in the left eye was lost.

Postoperatively, the patient complained of total loss of vision, with the pupils failing to respond to light. On the next day, the pupils reacted to light and vision gradually returned. When the patient returned on October 29, 1955, vision in the right eye with correction was 20/30 and in the left was light perception only. Vision in the right eye has remained the same to the present Dr. Mott noted that one of the very unusual aspects of this case was the unexpected recovery of vision in the right eye following the second operation.

Discussion. Dr. E. Rosenthal: I had a somewhat similar case of chromophobe adenoma, which was operated on in 1947. This patient at first had a central scotoma which suggested a macular lesion. Subsequently, a temporal peripheral defect was found. Following operation, she could read very well. The following day there was complete recovery of 20/20 vision and disappearance of the central scotoma. The patient has remained well till the present.

Dr. Wies: A remarkable aspect here is that the original eye with poor vision improved and that the original good eye became the bad one.

Dr. Freeman: I have noted that X-ray therapy in some cases can be very dangerous if started before surgery. Two cases were mentioned in which blindness followed X-ray therapy performed before surgery was done.

Dr. DeSuto-Nagy: I have seen operations performed by Dr. Oscar Hirsch with some remarkable postoperative recoveries of vision.

Dr. W. Glass: Although not unknown, the quadrantic defect inferiorly in the visual fields is rather unusual for early stages of pituitary tumor.

Dr. Clarke: Pressure upward pushes the optic nerve against the edges of the greater wing of the sphenoid and in this way may cause a lower field defect.

William I. Glass,
Recording Secretary.

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on Ophthalmology

February 16, 1956

Dr. I. S. Tassmann, *chairman*

Surgery of congenital cataract

Dr. Paul A. Chandler (Boston, Massachusetts) discussed the subject from the standpoint of indications for operation, optimum time for operation, choice of operation, and complications of surgery.

In bilateral complete or nearly complete cataract, operation is done on one eye under one year of age. If no complications are encountered with the first eye, the second eye is then done. If operation on the first eye is followed by serious complications, operation is deferred on the second eye until the child is two or more years of age. In cases of lamellar cataract unless the opacity is obviously so dense as to preclude useful vision, operation is deferred until the child is old enough for an accurate determination of visual acuity, usually five to seven years of age. If corrected vision is 20/50 or better, operation is not done. The handicap of somewhat defective vision is to be preferred to accepting the hazards of surgical interference.

As to choice of operation—in infants with

a dense opacity, iridectomy, inferior iridotomy, and linear extraction are advocated, whether or not the pupil dilates well preoperatively. It was felt that fewer complications occurred after this procedure than any other. In the case of lamellar cataract in older children, a good result may be obtained with various procedures. Dr. Chandler's preference is linear extraction with iridectomy, as resulting in fewer complications than other procedures in a large series.

Of the complications during operation, vitreous loss with linear extraction is the most serious. The incidence of this complication is greatly lessened if firm pressure on the globe is maintained for five minutes before commencing the operation in order to soften the globe. Great care in application of forceps, expressing lens cortex, and irrigation of the anterior chamber is very important.

Of the postoperative complications an inadequate pupillary opening, glaucoma, and retinal detachment are the most serious. An adequate pupillary opening is difficult to secure if the pupil becomes small or drawn up. It is felt that the operation of full iridectomy, inferior iridotomy, and linear extraction makes obtaining a satisfactory opening less difficult, especially in younger patients. The importance of long-continued use of atropine after operation is stressed. Topical use of steroids is important if the postoperative reaction is severe.

Glaucoma can occur from swelling of the lens and closure of the angle after discission. It is avoided by making a wide opening in the capsule so that the lens does not swell as a whole. Lens cortex may block the filtration meshwork and cause glaucoma. Treatment of these forms of glaucoma is prompt linear extraction.

Pupillary block is the most important cause of glaucoma after congenital cataract surgery. It is recognized in some cases by a frank iris bombé. In other cases there is unevenness of depth of the anterior chamber. The most characteristic sign is gross peripheral synechias extending well out onto clear cornea in one or more places. Slides were shown illustrating this appearance. Early recognition and early treatment are essential if the eye is to be saved. Treatment consists in peripheral iridectomy or iridotomy. This is completely effective if done in time. A case was presented in illustration. In neglected cases all vision is usually lost in spite of repeated surgical attempts. If discission must be done in the presence of a small pupil or in any case of pupillary block, peripheral iridotomy should be done at the same time to avoid block of the pupillary opening by vitreous.

Detachment of the retina may occur as a late complication of congenital cataract surgery. Results of operation for such detachments are relatively unfavorable. A serious problem in this connection is inability to see the peripheral fundus due to a small pupillary opening. The possibility of late detachment of the retina is an argument for full iridectomy in congenital cataract surgery so that the fundus can be better visualized and all the retinal breaks found.

The difficulties of congenital cataract surgery were stressed. It was felt that such surgery should properly be performed only by the most skillful and experienced surgeon.

William E. Krewson, 3rd,
Clerk.

MEMPHIS EYE, EAR, NOSE, AND THROAT SOCIETY

Esotropia changed to exotropia

Dr. Philip Meriwether Lewis reported a case of former esotropia which changed to exotropia without surgery.

P. C., a white boy, was 12 years old when first seen in 1934. He had been cross eyed since the age of two years and had never been examined or worn glasses. He had 45 prism diopters of esotropia for distance and near, good motility, no vertical deviation, and could fix with either eye but preferred the right. Vision was: 20/50, right; and

20/100, left. Under atropine cycloplegia he measured: O.D., +4.0D. sph. ⌒ +2D. cyl. ax. 110°; O.S., +4.0D. sph. ⌒ +1.75D. cyl. ax. 70°. Corrected vision was O.D., 20/40+; O.S., 20/50+. His eyes were no straighter with atropine than without. After wearing his glasses three weeks his eyes were still crossing just the same as before. Surgery was advised but not accepted by the family.

Two years later the esotropia had been reduced to 25 prism diopters with his glasses. Vision had improved to 20/30, O.D., and 20/40+, O.S. A lesser amount of surgery was still advised. In 1938, his eyes looked straight for both distance and near. Vision was 20/20, O.D., and 20/30, O.S. There was no fusion; either eye being suppressed alternately. The strength of his glasses was reduced but not enough.

Two years later, in 1940, there was an exotropia for distance of from four to 10 prism diopters, orthophoria for near, and for the first time the NPC had become very remote. The hyperopic correction was further reduced and convergence exercises were prescribed. In 1942 the exotropia was about the same. Corrected vision was 20/20, O.D., and 20/30, O.S. Still further reduction was made in his glasses.

The patient was not seen again until September, 1955. His refraction and vision were practically the same but the exotropia had greatly increased. It varied from five to 20 prism diopters for near and from 20 to 60 prism diopters for distance. He had the ability to hold the eyes almost straight for near but, when in a state of inattention, the left eye wandered far outward.

The course of events in this case while not unique is certainly unusual. If surgery had been done as advised, the left eye would undoubtedly have promptly diverged and reoperation would have been necessary. At the last session of this society I reported a case with an esophoria and occasional esotropia in which a total of nine mm. of recession of the medial recti and 16 mm. of resection of the lateral recti was done, but there was still an esophoria remaining. The case reported tonight had a constant and rather high esotropia which, without benefit of surgery, became a rather marked exotropia. All of which makes one feel very humble and nondogmatic.

Corneal perforation

Dr. Alice R. Deutsch presented the case of Mrs. R. W., aged 29 years, who was seen for the first time in December, 1951. She gave the history of recurrent episodes of eye inflammation since early childhood and several chalazia operations. At the date of the first examination she had a seborrheic blepharitis, a meibomitis, and conjunctivitis. There were also some small limbal infiltrations, especially in the lower half of the left eye. Physical examination was negative. PPD 1 and 2 solutions were also negative. Conjunctival and lid-margin cultures were positive for staphylococci.

In April, 1952, she developed a superficial punctuate keratitis, single lesions of which showed a distinct star-figure. Therefore, a herpetic etiology of the corneal disease was thought possible. The cornea was denuded, cauterized with iodine, and a pressure-bandage applied. The healing of the cornea was prompt but the blepharitis and conjunctivitis did not respond well to local and supportive treatment until staphylococcus toxoid was started in October, 1952.

In December, 1952, she had to leave Memphis. At this time very little scaling of her lid margins was visible and the conjunctivas were not inflamed. Her vision was: O.D., with a −1.0D. sph. ⌒ −0.5D. cyl. ax. 180° = 20/20, J1; O.S., with a −0.5D. sph. ⌒ 0.5D. cyl. ax. 180°, 20/20, J1. She used White's A & D ophthalmic ointment two or three times a week at bedtime and had had staphylococcus-toxoid regularly for the past two months. She was advised to continue this treatment. Cortisone was never used in any form because of a questionable herpetic etiology of the intercurrent keratitis.

She was not seen again until June 26, 1955, when she returned to the office because of a sudden severe pain in the left eye. She gave a history of having continued the shots for two months and that she did very well for six or eight months after termination of treatment. At this time the inflammation recurred; the left eye was especially bad and very painful until some "milky drops" were prescribed to her which she had used ever since, off and on, because they seemed to clear up the eye better than anything she had ever used before. She had not used the drops since her return to Memphis several weeks prior to her coming to the office, as she had done very well until that time.

When examined, a perforation of the cornea with iris prolapse was visible three mm. below the corneal center of the left eye. She was admitted to the hospital. Pilocarpine (two percent), and eserine (0.25 percent) were applied. Both eyes were patched and antibiotics were started. About five hours later the chamber was reformed and the iris had retracted but was adherent to the perforation. The next morning there was again no anterior chamber, the iris was not prolapsed. Two thirds of the cornea was covered by a conjunctival flap and air was injected in the anterior chamber. The air bubble stayed for four days. The anterior chamber was shallow for another three days. The patient was kept on pilocarpine (one percent) and Diamox (500 mg., twice daily) until July 6th (eight days). When the flap retracted the place of the perforation appeared thin and bulging and the chamber of normal depth. The eye was kept under a mild pressure bandage until October, 1955.

The patient now has a dense sharply outlined corneal scar with several superficial vessels, no anterior synechias, and no lens opacities. Her corrected vision equals 20/30, J3. The eyes are quiet. With massage of the meibomian glands at regular intervals, the blepharitis seems, at least at present, controlled.

Since thinning of the cornea after protracted use of local cortisone in interstitial keratitis and corneal perforation after its use in dendritic keratitis have been described, it seems entirely possible that this apparently spontaneous perforation of the cornea in a comparatively young and healthy person was caused by prolonged use of this drug. Because of the prominent position of cortisone as a therapeutic agent and its use in a variety of diseases, an evaluation of the advantages and probable hazards are indicated in every single case, as well as strict observation during its use and possibly also during a certain period after its discontinuance.

Eugene A. Vaccaro,
Recording Secretary,
Eye Section.

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SOUTH AMERICAN OPHTHALMOLOGY

In February, 1957, I had the privilege of being the guest of four South American universities—in São Paulo, Montevideo, Buenos Aires, and Santiago. The undergraduate medical schools were not in session. The object of these visits was to give graduate lectures in ophthalmology, and not to examine teaching programs, to participate in undergraduate instruction, or to evaluate the present status of South American ophthalmology. The following are, therefore, only random impressions gathered from conversations and discussions with a number of physicians and from visits to one special ophthalmic hos-

pital and several large university teaching hospitals.

In São Paulo, there are two medical schools. The first of these is the Escola Paulista, which was my official host. This was formerly a private institution but recently has been taken over by the Brazilian government and will henceforth be a federal, nationally supported school. In the Escola Paulista, the eye department is centered in a special ophthalmic hospital, remote from the medical school and the general teaching hospitals. The Clinica Ophthalmologica is housed in a rather handsome, substantial building, quite evidently built some years ago. Unfortunately, like its North American counterparts of the same era, it reflects the tenor of ophthalmology of its day. Indeed there is a strange similarity between this South American ophthalmic hospital and several similar hospitals in the the United States built around the turn of the century. All suffer the same defects.

While these hospitals were all undoubtedly the last word when they were built, ophthalmology has progressed so much in the last half century that they are now outmoded both in concept and structure. Small rooms, designed for some now forgotten purpose, are with difficulty adapted to house modern equipment. The cry for more space for rapidly growing out-patient departments has been met by removing partitions when possible. Constructed before the era of diagnostic laboratory examinations, a small clinical laboratory for blood counts and the examination of specimens was considered adequate for the most progressive ophthalmic clinics of that day. The steadily increasing need for more space to satisfy the clinical demands has left little opportunity to develop either clinical, diagnostic, or research laboratories.

The geographic remoteness of these ophthalmic hospitals from the general teaching hospitals to which they are technically attached, largely results in making the laboratory and diagnostic facilities of these teaching hospitals unavailable to the eye clinic. But probably more serious than the geographic isolation is the absence of day-to-day contact with the clinics of other branches of medicine, and the loss of the stimulation of daily association with physicians in other specialties. This geographic and ideologic isolation tends to stultify both the ophthalmic clinics and the ophthalmologists who practice therein. The major activities of the clinic become devoted to the immediate task of satisfying the most pressing ophthalmic needs of a large and rapidly growing community. For the ophthalmologist, the scientific practice of his profession in this environment becomes more and more difficult, and finally reaches the point where the effort is abandoned by all except a few faithful and long-suffering disciples. Research and original investigation are virtually nonexistent, except in occasional instances.

How much the Clinica Ophthalmologica suffers from the various ills which are common to the majority of isolated ophthalmic hospitals was difficult to estimate in the short time available. It is probably no marked exception to the rule. The department is, however, fortunate in having as its chief and on its staff men who fully recognize the now existing defects and who are acutely aware of the need for a new approach to ophthalmology. This recognition and this awareness of need for change are what argue for a bright future for the Department of Ophthalmology in the Escola Paulista. One of the most outstanding characteristics of the Brazilians, and especially of the Paulistas, is that they are a restless nation of energetic builders. With this characteristic, coupled with the facts that the Escola Paulista is now a federal school, the probable availability of public funds, and the obvious awakening interest in scientific ophthalmology, it appears to be only a question of time before the present outmoded special ophthalmic hospital will be a memory of the past, and the ophthalmologic clinic will be housed in modern and adequate quar-

ters and will be an integral part of the university teaching hospital. When this is accomplished, the Department of Ophthalmology in the Escola Paulista should be second to none in South America.

To this Clinica Ophthalmologica, Professor Alvaro had invited a number of Brazilian ophthalmologists to participate in a week's symposium on the subject of uveitis. Some 84 individuals from all parts of Brazil accepted his invitation, came to São Paulo, and, with courage and hardihood, stayed throughout the entire session. On the whole they were a highly intelligent group, eager to learn, and a stimlulating audience to teach. Among them were a number of well-trained and excellent clinical ophthalmologists. There were others who had lacked the opportunity for adequate training. But conversations and discussions with both groups revealed that, with few exceptions, they were interested not only in clinical work, but also in the basic sciences as applied to ophthalmology. What they lacked, and still lack except in the large cities, is the opportunity to study and be taught.

The second medical school in São Paulo is the state university school—the University of São Paulo Faculty of Medicine. The upsurge of new buildings and new design which makes São Paulo the fastest growing city in the world, is nowhere better exemplified than in this state university. Here, on extensive and beautifully landscaped grounds, stands a group of medical school buildings and a university teaching hospital which, in their physical appearance, far surpass anything in North America. Even the famed quadrangle of the Harvard Medical School is dwarfed by the magnificance and the size of the physical plant of the São Paulo University School of Medicine. As well as could be judged in the short time available, the equipment in the basic science buildings and general research laboratories was in keeping with the modern design and proportions of the buildings. The same is true of the University Hospital. This is a beautiful and modern hospital of 1,200 beds devoted entirely to free patients and fully supported by the state. Two new large additions, one for neuropsychiatry and one for orthopedics, are now under construction, the lower floors being already in use. These will increase the capacity of the hospital to 1,800 beds.

The Department of Ophthalmology, under the direction of Professor Rezende, is a self-contained unit in one wing of this University Hospital. It has its own wards, operating rooms, well-equipped pathologic and research laboratories, and subdepartments of neuro-ophthalmology, orthoptics, and so forth. The equipment is extensive and all of the most modern type. It would be difficult to think of any conventional apparatus for the clinical study of the eye which is not available in this clinic. But again the emphasis appeared to be chiefly on clinical examination and on ophthalmic surgery rather than on the basic sciences as applied to ophthalmology, or on original investigations or research. It was interesting that in a splendidly equipped pathologic laboratory, great stress still was placed on sections prepared and examined at the U. S. Armed Forces Institute of Pathology in Washington!

The over-all impression of Brazilian medicine gathered only from one city was that within the last decade great efforts had been made to advance better medical education. These efforts have thus far been largely confined to new construction, to new equipment, and to the training of personnel in the United States. As concerns ophthalmology in the state school, this physical development has been singularly successful, and the Department of Ophthalmology is well integrated in a splendid modern hospital. The staff is well organized and has on it several ophthalmologists who have been well trained abroad In the case of the private school, which heretofore has been handicapped by the lack of state or federal support, these efforts to modernize are still in progress. In both clinics the emphasis has been on the clinical side rather than on the scientific side of

ophthalmology. Original investigation and research, however, have made progress in physiology, in other of the basic sciences, and in some of the major clinical branches of medicine. A quickening of interest in scientific ophthalmology and ophthalmic research is already evident. It will probably be only a question of time when original investigation will be an integral part of Brazilian ophthalmology.

Uruguay presented a somewhat different picture, especially as concerned ophthalmology. Uruguay is a small country, scarcely larger than the state of Missouri. Unlike many other South American countries, for many years it has been free of dictators, political upheavals, and revolutions. Allowed to progress unhindered, it has achieved a remarkable social dvelopment. There are few, if any, large fortunes in this country, but there is likewise little or no poverty. The "middle class" is supreme. To the North American observer, it might appear that the educational system, the social security program, the pension plan, and other social advances are somewhat over-liberal and may be conducive to a dwindling of ambition and a too early retirement from an active business life. Nevertheless, the economy of the country is sound, the peso is stable, and there is a general atmosphere of happiness and content.

Medicine and ophthalmology have kept pace with these social and economic advances. As in other South American universities, the medical course covers seven years. The basic sciences—chemistry, biology, physics, and so forth—which in North America are taught in the colleges before one begins his medical education, are here embraced in the medical course. The student is apparently allowed as much time as he desires to complete the required seven-year program. He may repeat courses and take examinations time and time again until he finally passes them or gives up on his own volition. Under this paternalistic and compassionate administrative program the university has now reached the point where additional physical facilities are needed for teaching. Whether this need will be met by the construction of a new plant or integration of the school with the new hospital is still undecided.

The Department of Ophthalmology, under the directorship of Professor Isola, is housed in the new University Hospital. The department is well equipped and is remarkably well correlated with the excellent bacteriologic and clinical laboratories of the medical service. There is a definite spirit of investigation in both the departments of medicine and of ophthalmology. For example, in ophthalmology the role of toxoplasmosis in the etiology of granulomatous uveitis is under active study, and toxoplasmin skin tests and the Sabin-Feldman dye tests are done routinely in all uveitis patients.

The medical service, under the stimulating directorship of Professor Purriel, has an extensive investigative program. In brucellosis it was truly a case of the visiting lecturer coming to teach and remaining to learn! The over-all impression was that in the University of Uruguay a relatively small, but good ophthalmologic service was well integrated in an excellent general hospital. The ophthalmologists have succeeded in arousing in their medical colleagues an interest in ophthalmologic problems to the mutual advantages of both services.

In Argentina, the situation both as concerned medical education and ophthalmology appeared at present somewhat unfortunate. In this country there are seven medical schools, one large one in Buenos Aires and six others scattered throughout the outlying provinces. At the University of Buenos Aires the present plight of medical education and ophthalmology appears to be largely a reflection of the political turmoil to which this magnificent country has been subjected during the 10 years of the Peron regime.

In all fairness, certain significant contributions of Peron and the Evita Peron Foundation to medicine and to medical education should be mentioned. Chief of these are the

building of a new, modern, multistoried, well-equipped medical school to replace what was admittedly an overcrowded and obsolete plant. Also built by the Evita Peron Foundation are three 500-bed hospitals immediately outside the city limits proper. These hospitals are beautifully designed, lavishly constructed, and appear to contain every conceivable modern convenience. The old, 250-bed Hospital de Clinica, which was the main teaching hospital of the medical school, is being replaced by a new 1,000 to 1,200-bed modern hospital immediately adjacent to the medical school. This was begun under the Peron regime and is now nearing completion. Within a short time, therefore, the medical school of the University of Buenos Aires will have a new school and a new university teaching hospital.

One cannot help but mourn, however, for the passing of the old Hospital de Clinica. This is a charming old structure, built around a quaint and curious courtyard with many alleys and vistas. In the center of this courtyard stands a bronze statue of Pedro Lagleyze, the first professor of ophthalmology in the university. Nearby is an old bronze bell which in former years was rung whenever a full professor entered the courtyard, thereby giving proper warning to his minions that they might scurry to their appointed places and tasks before the great professor entered his own domain. On the departure of the professor, the bell was tolled again and the minions could then heave a sigh of relief and relax! This charming custom was abandoned in 1954 when Professor Arganarez retired.

Prior to the advent of Peron, the medical school of the University of Buenos Aires was already overcrowded. The entrance requirements were low, being limited to six years' instruction in the humanities and a baccalaureate with an oral and a written examination for admission. The seven-year medical education was entirely free, and the number of students was even then greater than could be properly taught. Had the new medical school been used to provide proper facilities for this already excessive number of students, and had the three new 500-bed hospitals been used as teaching hospitals for which purpose they were badly needed, there would have been but little criticism of Peron's attitude to medical education, and one might well discount or ignore the various rumors and stories of financial irregularities which are alleged to have accompanied the construction of the various units.

Peron's greatest appeal was to the masses of the workers, and not to the intelligentsia. The new school appears to have been used to promote still greater mass education, with little or no attention to the quality thereof. At first the admission requirements to the medical school appear to have been none too rigidly enforced. Later they appear to have been completely disregarded and abolished. The result was that in the last year of the Peron regime, there were 16,000 students registered in the Buenos Aires school alone. Of this number approximately 20 percent were from foreign countries, attracted doubtlessly by the easy admission and the lack of scholarship standards. There were over 3,000 students in the class of ophthalmology, all to be instructed by a part-time staff of seven instructors! In the classroom in the old Hospital de Clinica, where the lectures on ophthalmology were given, there was space for approximately 75 people. The largest classrooms in the new medical school buildings hold only 550 students. It was therefore a case of first come, first served. It is said that when one class in the medical school adjourned, the rush for places in the second class was such it resembled the "Charge of the Light Brigade." The standards for scholarship appear to have been correspondingly low with the students constantly slackening up in their studies. There was no mechanism for dropping failures who continued to take up space and steadily increase the registration. Under this almost incredible system of education, some 550 to 600 students were graduated yearly at the

University of Buenos Aires. The quality of the physicians thus trained and graduated can well be imagined.

The second charge made against the medical policy of the Peron administration was that appointments and promotions in the university faculty and the hospital staff soon ceased to be made on the considered judgment of the faculty and staff, but were dictated either directly or indirectly by political pressure. The basis for appointment or promotion became primarily political influence rather than academic distinction and clinical ability. As a result of this policy, there ensued a slow attrition of the quality of both the university faculty and the hospital staffs. As the situation gradually worsened, more and more of the older teachers and professors were forced out, retired, or resigned. One of the last to thus leave was Professor Arganarez, the dearly loved and distinguished professor of ophthalmology who resigned in 1954.

With the fall of the Peron regime, the control of the medical schools and the hospitals passed to the new provisional government, and through them to the anti-Peron segment of the medical profession, the hard core of anti-Peronistas who remained on the university faculty, the hospital staffs, or had previously been removed therefrom. The work of reconstruction began with plans for the enforcement of admission requirements, the drafting of more stringent ones, the institution of higher standards for scholarship in the medical school, and the removal of Peron appointees from the faculty of medicine and the hospital staffs. The great difficulty of these tasks is evident. With the enforcement of entrance requirements and higher standards of scholarship, there is already talk and fear of a student demonstration and strike. The political effect of some thousands of students parading through the streets of Buenos Aires protesting the attitude of the anti-Peronistas to the medical students and medical education can well be imagined. The danger of completely disrupting the faculty and the hospital staffs by wholesale removal of Peron appointees is also evident. Many of the men who were displaced during the Peron regime are no longer available for reappointment, and the physicians graduated in the last eight years are scarcely of university caliber. Nevertheless, there is definite evidence that progress is being made. Despite the threat of student demonstration or a strike, it appears probable that higher standards for admission and for scholarship will be enforced, and that poor students will be purged from the university rolls. Many of the personnel removed during the Peron regime are returning. A most notable example of this is the reappointment of Professor Hosay, the famous Nobel prize winner, to the professorship of physiology. There is a strong movement on foot, advocated by Dr. Ruardo Tanturi, surgeon-in-chief of the Polyclinica Lanus, one of the new 50-bed hospitals built by the Peron Foundation, to affiliate these hospitals with the University of Buenos Aires, the chiefs-of-service in the hospitals holding chairs in the medical school, much as is now the custom in North American medical schools.

Ophthalmology in Argentina appears to have deteriorated under the Peron regime although scarcely as profoundly as has medical education. One Argentine ophthalmologist summed up the situation as follows: "Ophthalmology stopped here 10 years ago when Peron came into power." This statement appears to be true as far as the basic sciences in ophthalmology are concerned. Ophthalmic bacteriology and pathology, physiologic chemistry as applied to ophthalmology, immunologic and serologic diagnosis of ophthalmic diseases for the time being appear almost to have ceased to exist. The need for these, however, is acutely realized and freely admitted. Dr. Baudilie Courtis, the newly appointed professor of ophthalmology, was visiting in the United States during the month of February and laying plans for the reorganization of his department.

The absence of what might be called scientific ophthalmology is not to be wondered at when the plight of the basic sciences in general is considered. However, there was little or no evidence of a decline in clinical practice or in the quality of ophthalmic surgery. The great body of ophthalmologists encountered appeared to be sound clinicians, eagerly interested in all modern advances, and regretting acutely their present lack of diagnostic facilities. There was a small minority who enthused about such things as placental implants, biogenetic stimulators, and various cure-alls for degenerative disease. But these enthusiasts are found in every country, and in Argentina were either frowned upon or laughed at by their more erudite and judicious colleagues.

One quite interesting experiment in clinical ophthalmology was observed in Buenos Aires. In Argentina, as in most other South American countries, the hospitals are state supported and all services are free. Private patients are seen in the physician's private office, and, if hospital care is needed, are cared for in private nursing homes. There is no provision in this system for the self-respecting working man who wishes to pay for medical services rendered, yet is unable to afford the usual fees charged private patients by physicians and the nursing homes. To fill this vacuum as concerns ophthalmic surgery, Dr. Raul Salleras, the son-in-law of Dr. Arganarez, has rented three small rooms immediately adjacent to an old and no longer popular nursing home down in an outlying sector of the city where workers and factory hands live. Here he has set up an ophthalmologic clinic—admitting office, examining rooms, treatment room, and a small, but well-equipped operating room—a veritable Japanese garden built in the top of a hat! Here patients are received three days a week. The charge for the first visit is the equivalent of 75 cents. Subsequent visits are about 10 cents. If an operation is required, the fee is between a minimum of approximately $12.00 and a maximum of about $75.00, the average fee being about $37.50. The standard hospital charge for four days' care in the nursing home is approximately $22.50 with a supplementary charge of $12.50 to pay the professional assistants. The maximum charged any patient for operation and all hospital expenses is $125.00. Payments on the installment plan are permitted and arranged. The clinic is crowded to capacity, and small wonder that it is. The quality of the surgery done is excellent and the technique superb. Here is a tiny semiprivate clinic, in open competition with adjacent, free, large, state-supported clinics, charging small fees, operating on a sound economic basis and self-supporting without endowment or any outside help—a phenomenon which might well give food for thought to many American hospital directors!

The over-all impression of medical education in Argentina was that it has suffered greatly as a result of political interference and economic unrest, but that the damage done was far from being irreparable. The Peron regime, whatever criticism it may merit, had left behind a new medical school plant and new and adequate teaching hospitals. There are probably sufficient first class teachers, physicians, and surgeons still remaining to staff the medical school and these hospitals. There is a definite renaissance in being, but there are dangers to be avoided. One of these is that in the removal of Peron appointees the pendulum may swing too far to the right and the medical faculty and hospital staffs be unduly depleted. Ophthalmology has suffered chiefly through the deterioration of instruction and training in the basic sciences and consequent decline in laboratory diagnostic facilities. The clinical side is still strong. The most encouraging observation was that these defects are acutely realized and there is a continued interest in scientific ophthalmology. In a country as rich as Argentina, the present vacuums in ophthalmology will be filled as the medical education improves.

The last city visited was Santiago in Chile. Unfortunately, the visit there was ill-timed —the last weekend in February which is akin to the Labor Day weekend in America. Everyone who could be away was out of town, and there was little chance to see much ophthalmology. However, there was an opportunity to visit the ophthalmologic clinic in the old San Borja Hospital. Although built at the end of the 18th century, this is still one of the teaching hospitals of the University of Chile. One enters this old hospital through the doorway of a low building directly on a busy street, and then through an archway into an unexpectedly beautiful courtyard. On each side are low, one-storied ward buildings. At the far end of the courtyard, through a vista of palm trees and walkways bordered by ferns, stands the old chapel. One felt as though suddenly he had been taken back some 200 years in what Bret Harte so aptly described as "the dying glow of Spanish glory." Yet with all its antiquity, the wards opening on the courtyard were immaculately clean, the beds well spaced, the patients apparently well cared for. Once inside a ward building the whole impression received was that of a well run and relatively modern hospital.

The Department of Ophthalmology was housed in an outlying building just adjacent to the main courtyard. Here again was the maze of small rooms on various levels, and with narrow passageways and stairs. But the operating room was large with clean painted walls and appeared to have all necessary equipment. Each of the examining rooms boasted some piece of new equipment—a Zeiss slitlamp, a binocular ophthalmoscope, a Haag-Streit perimeter, a synoptophore or whatnot—truly new wine in old bottles!

While there was little opportunity to see much of Chilean ophthalmology, through the courtesy of Dr. Janney, the representative of the Rockefeller Foundation in Chile, opportunity was afforded to visit the Salvador Hospital and the medical school of the University of Chile.

The Salvador Hospital is one of the three teaching hospitals affiliated with the medical school. It is a hospital of 800 to 1,000 beds. There are 30 private beds used almost exclusively for surgical cases, all the remainder are ward or free beds. One medical service has 140 beds. The laboratories in this service are comprehensive and all beautifully equipped. They would compare favorably with those of the most modern North American hospitals. Clinical-pathologic conferences are held three times weekly. Dr. Hector Ducci who was in charge during Professor Allessandro's absence is an authority on infectious hepatitis and is in charge of an extensive research program. The impression one gathered was that the medical service in this hospital was of the highest order. It was well staffed, equipped to practice the highest type of scientific medicine, and there was a high and active interest in original investigation.

The University of Chile Medical School presented a remarkable picture. The library and all the basic sciences buildings were completely destroyed by fire in 1948. A new University Hospital was then in course of construction. This was completed in 1954. After the fire an annual grant was made by the government for the rebuilding of the medical school. They were enabled to start from scratch, unhampered by the problem of utilizing or salvaging old buildings. There is thus in the making an entirely new medical school, one department integrated into the other and the whole integrated into an ultramodern teaching hospital under a single master plan. Dr. Alejandro Garretón, the dean of the medical faculty, was good enough to explain the over-all design. It was most impressive. Starting at the new library on one end, and terminating in the hospital at the other extreme, there was a succession of basic science buildings on one side with teaching, clinical, and research laboratories on the other. Truly the 1948 fire was a blessing in disguise! The entire plant will be finished within seven years. While not as

large or as architecturally impressive as is the São Paulo plant, it will probably stand for a long time as a model for an efficient plant for medical education.

The over-all impression of South American ophthalmology and medical education was that at present they are in much the same condition as we were in North America 40 years ago, but that it will take our South American colleagues less time than it did us to make the same advances. The South American schools are emerging from an era in which they were satisfied with clinical diagnosis, ordinary therapeutics and surgery alone, and from a period when political pressure and local politics played a large role in their administration. New schools have been built and are building. New standards of scholarship are being demanded. Old hospitals have been modernized and new hospitals are being built. In all the large cities there is an awakening interest in scientific medicine. Original investigation on a full time basis is already an active factor in the basic sciences. With only a few exceptions, however, the spirit of research and the desire to extend the frontiers of medical knowledge have not yet affected the clinical branches of medicine to any great extent. The exceptions to this are chiefly in the departments of medicine and in other fields of medical practice where fellowships for advanced clinical study in foreign clinics have been abundantly supplied by the Rockefeller and Kellogg Foundations and facilities for continuing research have been made available for the returning fellows. With the basic sciences leading the way, and the medical clinics following with their own research programs, it is only a question of time before the other branches of medicine, including ophthalmology, do likewise.

The present great need in ophthalmology in South America is a broader and more extensive training in the basic sciences, a correlation of the histologic and clinical changes in the eye with those of systemic disease, more attention to medical ophthalmology, and a realization that the eye is not an isolated organ with its own private set of diseases which are primarily the property and prerogatives of the ophthalmologist, in short—less accent on clinical ocular semeiology and the refinement of surgical technique and a greater accent on basic scientific and medical ophthalmology. However, this criticism applies equally to North and to South America. We in North America have been more fortunate than our South American colleagues. With a more stable government and with unparalleled prosperity, we have had the time, the tranquility, and the facilities to go ahead with both clinical and scientific investigation. What progress we have made is largely the result of our environment rather than due to any special intrinsic ability. It is to our discredit that with all our opportunities we have not done more. The time, the tranquility, and the facilities necessary for study of the basic sciences in relation to ophthalmology, and for the original investigation into the causes of ocular disease have been available to but few of our South American ophthalmologists heretofore. There is new hope the proper facilities soon may be generally available and there is certainly evidence of an awakened and eager interest in scientific ophthalmology among South American ophthalmologists. As their facilities increase, and North and South American ophthalmologists are drawn closer to each other, it is a sound prophecy that in a short time, a much shorter time than it took us to make what advances we have, they will close whatever breach there may be between us. They are a proud, an intelligent, and a sensitive people, quick to resent any slight or insult, but receptive and open to constructive criticism and warm and sincere in their appreciation of any help.

Finally, one cannot return from South America without a feeling of deep appreciation for their heart-warming and boundless hospitality. The warmth of their welcome, the spontaneity and the sincerity of their hospitality, and their grateful appreciation

for what little a visitor might contribute to them, awaken emotions of gratitude, friendship, and even of affection, none of which can easily be forgotten.

Alan C. Woods.

INTERIM PAN-AMERICAN CONGRESS

The 1957 Interim Congress of the Pan-American Association of Ophthalmology was held in New York City at the Hotel Statler, April 7th to 10th. The attendance of 475 ophthalmologists from Canada to the tip of South America broke all records for interim congresses and probably all records for Pan-American Congresses. The president of the United States sent a telegram of welcome which read:

> Please give my greetings to the Interim Congress of the Pan-American Association of Ophthalmology and the National Society for the Prevention of Blindness.
>
> Your common efforts demonstrate the many values of co-operative approach to the solution of problems we face together. With your impressive record of achievement, you are an inspiration to all citizens who are working to promote the health and welfare of the Americas.
>
> Best wishes for the success of your meeting.
>
> Dwight D. Eisenhower.

Under the leadership of President Brittain F. Payne, whose linguistic attainments ran the gamut from very practical Spanish to highly unreconstructed Texan, language barriers seemed to melt away. The New York members did their best to entertain our Latin colleagues with a hospitality similar to that enjoyed by us when visiting "south of the border." The congress was further supplemented by joint meetings with the 1957 conference of the National Society for the Prevention of Blindness.

The meeting opened with a joint luncheon which was addressed by Mayor Wagner of New York who amused the audience with his valiant struggles to pronounce "retrolental fibroplasia." The mayor noted that the city spent nearly $1,000,000 a year for poor patients hospitalized by eye diseases, as well as $10,000,000 a year for the 14,000 who are blind. Saying he had been informed that half of all blindness could be prevented, he emphasized the importance of prevention because of the city's 750,000 "senior citizens" in the age group in which half of all blindness occurs.

Dr. Frank B. Berry, assistant secretary of Defense for Health and Medical Affairs, spoke of the opportunities for research by physicians in the military services and for spreading the latest developments in many countries that receive our military assistance.

Other speakers at the luncheon were Surgeon General Ogle, U.S.A.F., Dr. Moacyr Alvaro, and Mr. Mason Bigelow, president of the National Society, who awarded Leslie Dana Gold Medals to Mrs. Eleanor Brown Merrill and Miss Evelyn M. Carpenter for conspicuous service in prevention of blindness. The formal dinner on Tuesday evening was addressed by former Ambassador Adolf Berle and Dr. Howard Rusk both of whom deeply impressed the audience from all countries.

The scientific sessions were highlighted by three symposia: Diseases of the ocular fundus," "Ocular surgery," and "Ocular therapy," moderated respectively by George Wise, John Dunnington, and Irving Leopold. Some eight "official" papers from Latin ophthalmologic societies were presented in Spanish, Portuguese, and English and an even dozen "free" papers by various North American authors. These latter were alternated with an equal number of motion pictures, mostly surgical in nature.

Scientific and commercial exhibits were few in number because of limited space but all of high caliber. Surgical clinics at the various hospitals in and around New York were enthusiastically attended.

All in all the meeting was highly successful—a pleasant intermingling of scientific exchange, social activity, and international friendship. Many of those present were heard to announce their determination to attend the Caribbean cruise meeting in Feb-

ruary, 1958, and the next formal Pan-American Congress in Caracas, Venezuela, in 1960.

John M. McLean.

OBITUARY

WILLIAM HERMAN STOKES
(1894-1957)

Dr. William Herman Stokes died in Lake City, Michigan, on April 8th, after a recurring illness of many years. He was born in British East India on July 17, 1894, the son of Herman and Ellen Hill Stokes. He was a graduate of Tübingen Gymnasium in Germany, coming to the United States in 1913. He was naturalized in 1918 at which time he was a lieutenant in the Sanitary Corps, U. S. Army, with the A.E.F.

Dr. Stokes was graduated from the University of Michigan Medical School in 1922 and served the following three years as resident in ophthalmology at the University Hospital, Ann Arbor, Michigan.

In 1925 Dr. Stokes became ophthalmologist for the Dallas Medical and Surgical Clinic in Dallas, Texas, where he remained in practice until he was appointed associate professor of ophthalmology in the Medical College, University of Nebraska, in 1930. He held the chair of professor and chairman, Department of Ophthalmology, in the same school between 1933 and 1943, when he was forced by illness to resign. Since retirement he had been conducting a limited practice in Lake City, Michigan, but continued to maintain an active attendance at national meetings. He was fellow of the American College of Surgeons.

Dr. Stokes' death was a serious blow to the community he had been serving and to his colleagues in Michigan. His frequent visits to the University Hospital at Ann Arbor were always much appreciated by the ophthalmology staff because of the advice and council given the younger members. Dr. Stokes is survived by his wife, Margaret Ann.

CORRESPONDENCE

SPASTIC ENTROPION

Editor,
American Journal of Ophthalmology:

In 1931, Dr. Wendell L. Hughes published a brief article in THE JOURNAL concerning a simple procedure for the cure of spastic entropion (Am. J. Ophth., 14:34 [Jan.] 1931) from which I quote:

"Through the needle used for preliminary procaine anesthesia, 95-percent alcohol is injected into the outer fibers of the orbicularis muscle near the margin of the lower lid. The method is simple, painless, and usually permanent in its effect."

Since this procedure was previously reported by Elschnig and Dupuy-Dutemps, it should be fairly well known. I find, however, that it is not as widely used as it should be.

In my work at various hospitals with elderly, bedridden individuals, it is not uncommon to see a spastic entropion in debilitated patients. Since these individuals usually have severe cardiac conditions or are victims of a chronic disabling disease, a procedure which is as conservative and simple as possible is indicated. In these cases the procedure which was described by Dr. Hughes is ideal. The only comment I wish to make is that the alcohol which is labeled "absolute" and is obtainable in two-cc. ampules commonly used for nerve injection may be used. If the syringe is filled beyond the 0.2 to 0.3 cc. of alcohol recommended and a small amount is allowed to pass through the needle while withdrawing, a small tract through the skin may be formed, and some minimal slough may take place.

When the initial procaine injection does not cause an immediate rolling out of the lid border, the alcohol injection should not follow.

In my personal contact with Dr. Hughes, I note that he continues to use this method with great success in his office practice.

(Signed) Peter H. Ballen,
Hempstead, L. I., New York

BOOK REVIEWS

AUGENSYMPTOME BEI HIRNTUMOREN. By Alfred Huber, M.D. Bern and Stuttgart, Hans Huber, 1956. 340 pages, 192 beautiful illustrations, extensive bibliography, index. Price: 56 Swiss francs.

The author is privat dozent for ophthalmology in the University of Zürich. There is a foreword by Professor Krayenbühl, director of neurosurgery at the university, who pays proper respect to the author who is an expert in neuro-ophthalmology.

This is an excellent book, beautifully printed and illustrated, so that even the non-German reader can get considerable pleasure out of thumbing through the pages. It is a particular joy to the ophthalmologist and, of course, the neurosurgeon who reads German.

There are five chapters—the first has to do with the neuro-ophthalmologic examination, then one on the symptomatology of increased intracranial pressure in brain tumor, which discusses exceedingly well choked disc, ocular muscle paralysis, pupillary changes, and exophthalmos. The third chapter discusses local symptomatology of brain tumors. The next is a relatively short but adequate chapter on the relationship between types of tumors and ocular symptoms. Finally, an excellent chapter on pseudotumors which includes intracranial aneurysms. Chapter six is a summary, or rather a short recapitulation, of what is to be found in the various chapters.

This is truly a splendid work. I wish that it were available in English. It can be obtained in this country from the Intercontinental Medical Book Corporation, 381 Fourth Avenue, New York 16, New York.

Derrick Vail.

SYMPOSIUM ON VITAMIN METABOLISM. Held under the auspices of The University of Texas and The National Vitamin Foundation, Incorporated, in New York City, March 6, 1956. New York City, National Vitamin Foundation, Inc., 1956. 118 pages, paper bound. Price: $2.50.

In the foreword to these proceedings Dr. Snell states that investigations of vitamins may be divided into four stages. First the finding of a factor that is essential to the well being of a certain species; second, a quantitation of the factor and development of assay methods; third its isolation, synthesis, and commercial exploitation; and much later, the fourth stage, an analysis of the mechanism of action of the vitamin.

Although most ophthalmologists are aware that the vitamins are essential to the proper functioning of the eye, the grasp of their biochemical function is usually limited to the knowledge that vitamin-A deficiency causes nightblindness. This symposium will unfortunately not implement this kernel of information, since the participants are outstanding biochemists who are understandably interested in the metabolic detail of co-enzyme action and not in clinical ophthalmology. After a general introduction by Severo Ochoa, there are eight chapters each devoted to the metabolism of a specific vitamin. This symposium will be of interest primarily to those investigators who already have a rather detailed knowledge of the metabolism of vitamins.

David Shoch.

HISTAMINE. Edited by G. E. W. Wolstenholme and C. M. O'Connor. Boston, Massachusetts, Little, Brown and Company, 1956. 460 pages, 133 illustrations, author and subject indexes. Price: $9.00.

This is an extensive report of a symposium held in London, April, 1955, by the Ciba Foundation jointly with the Physiological Society and the British Pharmacological Society in honor of Sir Henry Dale, a pioneer in the subject. The Ciba Foundation Symposia on basic subjects have justly become famous and 14 or so of these symposia have already been published, and widely appreciated. More are on the way. Thirty-

two authorities from many places in the world participated in this one; four of them were from the United States.

Histamine is widely distributed in the body and scarcely an organ is free of it. This includes the eye and, for that reason, this volume should interest most of us, but particularly the ophthalmic physiologist and pharmacologist. The role of histamine in allergic ocular conditions and in acute glaucoma is, as yet, poorly understood by many of us and it is hoped that this work will stimulate our experimental laboratory brethren to help to clarify our confusion and ignorance.

We owe a great debt to the Ciba Foundation.

Derrick Vail.

BONE STRUCTURE AND METABOLISM. (Ciba Foundation Symposium.) Edited by G. E. W. Wolstenholme and C. M. O'Connor. Boston, Little, Brown and Company, 1956. 299 pages, 121 figures, index. Price: $8.00.

The skeleton was long considered to be of minor interest. However, the introduction of radioactive isotopes to the study of the metabolism of calcified tissues clearly established the labile state of the mineral salts. Since 1946, the distribution of the mineral salts has been studied by quantitative X-ray microscopy. Their molecular organization is well suited for ion-exchange mechanisms. The minute size of the crystallites provides an enormous surface area—130 sq.m. per one gm. of bone salt. Infrared spectroscopy suggests a binding between the sulfate groups of the organic part and the phosphate groups of the mineral part of bone. The nonsulfated polysaccharides (hyaluronic acid and chondroitin) are components of ground substances, while the sulfated polysaccharides are components of structural elements. The latter include the chondroitin sulfates and, of special interest to ophthalmology, keratosulfate, first isolated from the cornea where it represents one half of the total mucopolysaccharides. It has since been isolated from calf bone.

Finally, the applications of the new concepts of bone metabolism to clinical medicine are lucidly discussed.

James E. Lebensohn.

A STUDY OF WORK EFFICIENCY OF BLIND AND SIGHTED WORKERS IN INDUSTRY. By D. C. MacFarland. New York, American Foundation for the Blind, 1956. Paperbound, 58 pages, bibliography. Price: $0.70.

This is the first study comparing totally blind industrial workers with sighted employees. The 38 blind workers in this analysis earned somewhat less than their sighted coworkers ($1.50 per week per person). Blind workers are definitely as efficient as the sighted but under normal circumstances the blind worker apparently requires more intelligence to do as well as the sighted worker in the same job. Tardiness and absence records favored the blind worker as likewise the safety records, the time lost for severe accidents being 27 percent less than that of their sighted competitors.

James E. Lebensohn.

ABSTRACT DEPARTMENT

EDITED BY DR. F. HERBERT HAESSLER

Abstracts are classified under the divisions listed below. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. Anatomy, embryology, and comparative ophthalmology
2. General pathology, bacteriology, immunology
3. Vegetative physiology, biochemistry, pharmacology, toxicology
4. Physiologic optics, refraction, color vision
5. Diagnosis and therapy
6. Ocular motility
7. Conjunctiva, cornea, sclera
8. Uvea, sympathetic disease, aqueous
9. Glaucoma and ocular tension
10. Crystalline lens
11. Retina and vitreous
12. Optic nerve and chiasm
13. Neuro-ophthalmology
14. Eyeball, orbit, sinuses
15. Eyelids, lacrimal apparatus
16. Tumors
17. Injuries
18. Systemic disease and parasites
19. Congenital deformities, heredity
20. Hygiene, sociology, education, and history

1

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Bárány, E., Berggren, L. and Vrabec, F. **The mucinous layer covering the corneal endothelium in the owl Strix aluco.** Brit. J. Ophth. **41**:25-30, Jan., 1957.

It had been reported that the aqueous humor of certain owls is slimy, highly viscous and is easily spun into threads. The eye of the tawny owl was studied before and after death. It was shown that the aqueous is indeed very viscid, particularly in the center of the very large anterior chamber and there is circulation of less viscid fluid near the iris and cornea. It was interesting to note that the layer of fluid nearest the iris was much more motile than that near the cornea. (5 figures, 5 references) Morris Kaplan.

Rohen, Johannes. **The angle of the anterior chamber in men and animals.** Arch. f. Ophth. **158**:310-325, 1957.

The ciliary body in monkeys, cats, dogs, rabbits and hogs was studied anatomically. In rabbits, and to some extent in carnivores also, the ciliary body presents two structures: the posteriorly situated ciliary muscle and the anterior connective tissue body with large meshes containing aqueous humor. The ligamentum pectinatum attaches the iris to the cornea. The scleral surface for the resorption of aqueous is large, Schlemm's canal is missing. In man and primates the larger ciliary muscle narrows the angle of the anterior chamber, Fontana's space mostly disappears and Schlemm's canal becomes noticeable. A functional relationship between the ciliary muscle and the outflow structure seems to exist. Anterior muscle fibers make connections with Schlemm's canal and Mueller's muscle helps in the fixation of the iris. The ligamentum pectinatum iridis shrinks, remaining just strong enough to support a fine endothelial membrana iridocornealis. This reduction of the iris endothelium seems to be produced by the narrowing of the angle of the anterior chamber due to the enlarging of the ciliary muscle. (6 figures, 29 references) Ernst Schmerl.

Stoecklin, Peter. **The lens of the child, its normal variations.** Arch. f. Ophth. **158**:346-359, 1957.

215 children, six to seven years old, were examined in mydriasis with slitlamp and corneal microscope. Most of the children showed some opacities of the coeru-

lea type, 45 percent showed anterior axial embryonic opacities. Opacities near the posterior Y were also observed. No coronary cataracts could be found, they do not seem to develop before puberty. Lens nuclei were noticeable in the majority of cases and the ratio of thickness of the nucleus to that of the cortex is given as 10:2. (5 figures, 15 references)

Ernst Schmerl.

Vrabec, F. **The amorphous substance in the trabecular meshwork.** Brit. J. Ophth. **41**:20-24, Jan., 1957.

In studies of the innervation of the trabeculae, an amorphous substance between the trabeculae has been noted which bears out earlier observations by Virchow. In most methods of staining this substance became lost or misplaced but a type of staining using Celodal clearly showed this substance to fill the spaces between the trabeculae. The substance stains metachromatically. (4 figures, 7 references)

Morris Kaplan.

2

GENERAL PATHOLOGY, BACTERIOLOGY, IMMUNOLOGY

Chen Sen Hi. **Experimental study of retinopathy caused by intravenous injections of adrenalin.** Vestnik oftal. **1**:33-34, Jan.-Feb., 1957.

In 30 rabbits injections of 0.1 percent solution of adrenalin were given into the ear vein daily or every other day, in doses of 1.2 to 13.7 ml. The eyes were enucleated from seven to 30 days after the injections were started. The ophthalmoscopic examination showed 1. diffuse edema of the retina with dilatation of the choroidal vessels, 2. limited opaqueness of the retina, 3. detachment of retina due to accumulation of exudate in the subretinal space, and 4. limited retinochoroidal hemorrhages, some of which were between the external deep layers of the retina and the choroid. In some a large triangular hemorrhage was observed. The peripheral part of the hemorrhage was bright red, the central part pale blue with a violet tint; this later spread into a hemorrhagic exudate over the whole fundus. Histologic study of the tissues of the fundus showed dilation of the choroidal vessels filled with erythrocytes, edema of the retina, degeneration of the outer neuroepithelium, hyperemia and edema of the choroid with hemorrhages, and focal detachment of the retina due to exudate. The inner layer of the retina was thickened, vacuoles were found and there was hypertrophy of the layer of ganglion cells and multiplication of the cellular nuclei of the inner granular layer. The ganglion layer of the retina was thickened, the glial cells had multiplied, at times with formation of new capillaries. The changes suggest a proliferative retinitis, developing as a result of a disturbance of the choroidal circulation around the optic nerve. (3 figures)

Olga Sitchevska.

Verrey, Florian. **Bacteriology of the aqueous.** Klin. Monatsbl. f. Augenh. **130**: 215-234, 1957.

This is a survey article on the past experience on this subject. About 30 types of microorganisms have so far been cultured from the aqueous. The cytologic aspect is discussed. The aqueous puncture will give a positive bacteriologic result in about 4 percent of the cases. (16 figures, 2 tables, 121 references)

Frederick C. Blodi.

Weimar, Virginia. **Polymorphonuclear invasion of wounded corneas: inhibition by topically applied sodium salicylate and soybean trypsin inhibitor.** J. Exper. Med. **105**:141-152, Feb., 1957.

In wound healing, there is a three day phagocytic exudative stage before the formation of new connective tissue. The in-

filtration of polymorphonuclear cells is accompanied by liberation of proteolytic polypeptides. This process was studied in rat corneas. After a two-millimeter central corneal cut was made, the eye was enucleated and fixed. The corneal epithelium was scraped off, and a strip was further treated, stained, and mounted in oil of Balsam. The number of cells per oil immersion field were counted near the wound area.

In control corneas, the cell counts averaged 3.0 per microscopic field; in incised corneas, the number increased to 4.6 after four hours, 14.4 in five hours, 23.3 in six hours, and 26.2 in eleven hours. In eyes treated after injury by either 0.1 molar sodium salicylate or 2 percent soybean trypsin inhibitor eye drops, the cell counts dropped 91 percent. The reduced migration of polymorphonuclear cells was attributed to the inhibition of proteolytic substances which may be necessary for the cells to escape through the blood vessel wall. (3 tables, 4 charts, 23 references) Paul W. Miles.

Witmer, R. **Serology of the aqueous.** Klin. Monatsbl. f. Augenh. **130**:234-249, 1957.

The value of quantitative serology is first discussed. The antibody activity has to be calculated per gm. globulin so that aqueous and serum values can be compared. Paper electrophoresis is a valuable method for these determinations.

In animal experiments it could be shown that in systemic infections the antibody titer of the aqueous never exceeds one-third of that of the serum. If, however, the eye is the primary focus of infection this relationship of antibody titers is reversed. Plasma cells in the uvea produce these antibodies, though the titer rises first in the serum.

The hemagglutination test for tuberculosis (Middlebrook-Dubos) was positive in the aqueous of seven out of 100 patients with endogenous uveitis. In the same series the agglutination in the aqueous was positive for leptospirosis in two, brucellosis in two, and toxoplasmosis in three. No positive reaction was found for syphilis and gonorrhea. Out of 32 patients with chronic uveitis a positive antistreptolysin titer in the aqueous was found in ten. Antibodies against lens proteins could be found in one case of phakogenetic uveitis. (5 tables, 41 references)

Frederick C. Blodi.

Wolter, J. R. and Butler, R. G. **The pathology of papilledema of the human eye.** Klin. Monatsbl. f. Augenh. **130**:154-163, 1957.

The eyes of a 54-year-old woman with papilledema were obtained at autopsy. The sections were stained with the silver carbonate method of Hortega. Remarkable was the presence of numerous cytoid bodies in the swollen disc. They, together with an accumulation of fluid, account for the swelling. These cytoid bodies are undoubtedly a degenerative product of the nerve fibers. They are not peculiar to the retina, but correspond to the typical degeneration of nerve endings as described by Cajal. Their occurrence in front of the cribriform plate would speak for a strangulation of the fibers in that area. (6 figures, 15 references)

Frederick C. Blodi.

3

VEGETATIVE PHYSIOLOGY, BIOCHEMISTRY, PHARMACOLOGY, TOXICOLOGY

Bárány, Ernst H. **The action of different kinds of hyaluronidase on the resistance to flow through the angle of the anterior chamber.** Acta Ophth. **34**:397-403, 1956.

This is the report of experimental work on enucleated eyes of cattle. Former studies suggested the presence of a mucopolysaccharide component in the barrier to the outflow of the aqueous humor; in this one

hyaluronidases of different origin were used to determine their comparative effect on the barrier to outflow. The preparations used were a testicular and a bacterial hyaluronidase, dry crude Crotalus terrificus venom, and Apicur, a bee venom preparation of Hoffman-LaRoche. All these preparations caused the same decrease in the resistance of the perfused chamber angle. Since the only activity common to these preparations is the ability to depolymerize hyaluronic acid and related mucopolysaccharides, it seems justifiable to conclude that they all attack a mucopolysaccharide which obstructs the outflow of the aqueous humor. (3 figures, 1 table, 14 references) Ray K. Daily.

Berggren, L. and Brolin, S. E. **The retinal vessels of alloxan diabetic rabbits subjected to simulated high altitudes.** Acta Ophth. **34**:391-396, 1956.

Alloxan diabetic rabbits were kept for one month in a pressure chamber at a simulated heights of 8,000 meters. The eyes were enucleated and the vascular pattern of the retina studied in flat preparations. No true aneurysms were found. It is concluded that neither reduced oxygen supply nor the stress reactions of the experiment are capable of provoking capillary aneurysms in experimental diabetes. (1 figure, 1 table, 14 references)

Ray K. Daily.

Boeke, W. and Janssen, G. **Damage of the optic nerve due to INH (Isonicotinic acid-hydracid). Experimental studies.** Arch. f. Ophth. **158**:334-345, 1957.

The authors had made the clinical observation that in a number of patients with tuberculous meningitis optic neuritis developed after the administration of INH —streptomycin. Studies in normal rabbits showed that large doses of INH produced massive hemorrhages within the meninges, the floor of the brain and near the optic nerves. Intrathecal injections caused even more damage than subcutaneous administration. This possibly was due to a direct injury of the nerve fibers or the smaller blood vessels of the optic nerve. (5 figures, 28 references)

Ernst Schmerl.

Boyer, H. K., Suran, A. A., Hogan, M. J. and McEwen, W. K. **Increase of residual protein of bovine vitreous during growth of the eye.** A.M.A. Arch. Ophth. **56**:861-864, Dec., 1956.

The authors proposed to determine whether, during normal growth, the increased volume of the eye is occupied by a gel-like vitreous or by the secretion of a "liquid vitreous" into a preformed residual protein structure. Their studies seem to indicate that the former is true, that is, that there is an actual growth of the vitreous itself. (1 table, 8 references)

G. S. Tyner.

Faldi, S. **Clinical evaluation of Vasosterone (a vasoconstrictor).** Gior. ital. oftal. **9**:498-508, July-Aug., 1956.

Vasosterone (tetra-hydro-naphtyl-imidazoline hydrochloride 0.1 percent, hydrocortisone acetate 1.0 percent, neomycin sulphate 0.5 percent) proved to be a very potent vasoconstrictor without secondary vasodilatation in 100 cases of inflammatory lesion of the conjunctiva. Its value as a preoperative drug is emphasized.

V. Tabone.

Gloster, J., Perkins, E. S. and Pommier, M. L. **Extensibility of strips of sclera and cornea.** Brit. J. Ophth. **41**:103-110, Feb., 1957.

In a previous study the authors found that the coefficient of ocular rigidity did not remain constant above 5 mm. Hg, as stated by Friedenwald. Instead they found that K increased as pressure increased and therefore it was impossible to formulate a simple expression for the relation of change in volume to changes in pressure. To aid in explaining this finding, a study

was made of the extensibility of strips of cornea and sclera of the rabbit eye. Uniform strips, 1 mm. wide, were clamped at one end while the other was fixed to one arm of a balance. The other arm of the balance carried a scale pan to which weights were added and the amount of stretch was noted on a scale attached to the beam. These tests showed that, when the tension in the strip was increased, elongation was rapid at first but became progressively slower until stretching was completed. The elongation of the strip for a given increase in tension decreased as the initial tension increased, up to a value of approximately 15 g. wt./cm. (5 figures, 1 table, 5 references)

Lawrence L. Garner.

Jacobson, J. H. and Basar, D. **The effects of a new drug, Nylidrin, upon the electroretinogram.** A.M.A. Arch. Ophth. **56**:865-868, Dec., 1956.

Nylidrin (Arlidin) is a synthetic epinephrine-ephedrine-like drug. It is apparently a potent vasodilator and produces an average increase in retinal blood flow of about 32 percent. The drug is administered orally and produced by the U. S. Vitamin Corporation. (2 tables, 9 references) G. S. Tyner.

Lampis, Raffaele. **Influence of the diencephalon and the pituitary on the retinal light threshold.** Gior. ital. oftal. **9**:521-532, July-Aug., 1956.

Experiments carried out on healthy men, 26 to 32 years of age, showed that barbiturates lowered light sensitivity slightly and local instillation of a solution of melanophoric hormone increased light sensitivity. When barbiturates and melanophoric hormone were used at the same time the effect of the latter prevailed. Anatomic and physiologic considerations suggest that the diencephalon has an influence on light sensitivity. (3 figures, 60 references) V. Tabone.

Langham, M. E. and Lee, P. M. **Action of diamox and ammonium chloride on formation of aqueous humour.** Brit. J. Ophth. **41**:65-92, Feb., 1957.

Adult rabbits were used in this study and blood samples were taken from the median artery rather than by atrial puncture. Given intravenously, Diamox produced a very temporary lowering of the pH as well as the bicarbonate concentrations in the blood and aqueous. A rapid, but very temporary decrease in rate of flow of the aqueous was also noted. No effects on the rate of secretion of ascorbic acid or the distribution of sodium between the blood and aqueous was noted. The rapid fall in intraocular pressure was followed by partial or complete recovery. Ammonium chloride in doses large enough to produce acidosis resulted in a more prolonged reduction of tension than was noted from Diamox. A temporary reduction in rate of flow results from Diamox whereas this reduction of flow is more prolonged when ammonium chloride is used. The exact mechanisms of action are unknown, but the reduction in pH may be the factor. (6 figures, 13 tables, 65 references) Lawrence L. Ganer.

Miller, Edwin M. **Effect of acetazoleamide on the dark-adaptation function in glaucoma.** A.M.A. Arch. Ophth. **56**:869-877, Dec., 1956.

In glaucomatous eyes acetazoleamide does not adversely affect the dark adaptation when administered in the usual doses. (6 figures, 20 references) G. S. Tyner.

Perkins, E. S. and Gloster, J. **Distensibility of the eye.** Brit. J. Ophth. **41**:93-102, Feb., 1957.

Ten rabbit eyes were used in experiments which substantiated previous observation that elevations of intraocular pressure are higher after injections of equal amounts of fluid, if the initial tension is higher. The coefficient of ocular

rigidity K was not found to be constant, as previously reported by Friedenwald, but instead was found to increase with the increase in intraocular pressure. When this test was checked in a dead eye the K was found to show the same type of variation but more markedly so. The lower value of K in the living eye was thought to be due to the "cushioning effect" of the distended choroid. (6 figures, 2 tables, 9 references)

Lawrence L. Garner.

Rizzini, V. and Del Buono, G. **Effect of Diamox on the sodium and potassium concentration in the aqueous of the rabbit.** Gior. ital. oftal. 9:509-519, July-Aug., 1956.

Experiments showed that Diamox did not affect the potassium concentration in the aqueous and did bring about diminution of the sodium concentration. (2 tables, 2 graphs, 39 references)

V. Tabone.

Schweer, G. and Pook, W. H. **Can Ditterbrandt-Weichselbaum's biuret reaction be used in quantitative protein reactions of vitreous body filtrates?** Arch. f. Ophth. 158:387-392, 1957.

The authors describe a modification of the methods described by Weichselbaum (Am. J. Clin. Path. 16:40, 1946) and Ditterbrandt (Am. J. Clin. Path. 18:439 and 723, 1948). This modification permits the use of the method for viterous body filtrates. For technical details the original paper must be consulted. (1 figure, 4 tables, 12 references) Ernst Schmerl.

Stepanik, J. **The visible aqueous outflow.** Klin. Monatsbl. f. Augenh. 130:208-215, 1957.

The speed of flow can be measured in an aqueous vein by producing "pseudo-projectiles" which consist of red blood cells forced into the aqueous vein by a short-lasting pressure on the vein above its first connection. The speed is too rapid for the usual measurements and a movie camera had to be designed which could be mounted on a slitlamp.

In 18 aqueous veins the speed of flow varied between 2.9 and 8 mm./second. The volume that is transported in one big aqueous vein varies from 0.22 to 3.26 cmm./minute. The mean value of 1.08 cmm. would be near half of the total aqueous outflow as calculated by Grant. The calculated speed speaks for a low pressure within Schlemm's canal while the main pressure gradient lies in the meshwork. (1 figure, 1 table, 11 references)

Frederick C. Blodi.

Trichtel, F. **Distribution of iodine in the eye and its time factor following intravenous injections.** Arch. f. Ophth. 158: 380-386, 1957.

The author injected rabbits intravenously with a solution of sodium iodine containing 400 micrograms of iodine 131 (200 micro-Curie) as a tracer substance. The activity was determined with a Geiger-Mueller instrument. Sclera, aqueous and cornea showed rather high activity within an hour. The vitreous body showed increasing activity for 36 hours. The optic nerve, lens, choroid and retina showed activity too small to permit definite judgment. (4 figures, 1 table, 6 references) Ernst Schmerl.

4

PHYSIOLOGIC OPTICS, REFRACTION, COLOR VISION

Barraquer, T. and Barraquer, J. **The new direction of therapy for progressive myopia.** Arch. Soc. oftal. hispano-am. 16: 1137-1144, Oct., 1956.

The authors describe their search for a surgical procedure which would restrain the distension of the posterior pole of the globe. After trying a lamellar scleral resection in a number of cases and Mal-

bran's procedure in four cases, the authors arrived at the following procedure. A lamellar scleral resection is performed in the temporal portion of the globe between the insertion of the superior and inferior rectus muscles. Then a conjunctival incision is made nasally and the medial rectus temporarily tenotomized. The capsule and ligaments of the oblique muscles are dissected as far as the optic nerve. A strip of formalin-preserved and washed sclera, 12 mm. long, is inserted in such a manner that it encircles the optic nerve. The scleral strip is sutured so that it reenforces the posterior pole of the eye. The extraocular muscles, Tenon's capsule and the conjunctiva are then replaced. The authors claim that this procedure is more effective and less complicated than Malbran's procedure, which for the same purpose utilizes a vertical strip of fascia lata. The greater effectiveness of the authors' technique is attributed to the homologous nature of the material used, to the greater width of the strip, and to its fixed position. This operation is safer because it does not interfere significantly with the oblique muscles or the vortex veins. The horizontal position of the restraining belt is more rational than a vertical one. Having developed technical dexterity on the cadaver, and having determined that the operation is safe by operating on eyes which were to be enucleated, the authors now use and advocate this operation for eyes with high myopia. In the course of their experience the authors found that in myopic eyes the insertion of the oblique muscles especially of the inferior oblique, is much more anterior than normal. They suggest the possibility that the traction of the oblique muscles is a factor in the etiology of progressive myopia. Section of the posterior ligaments of these muscles may contribute to the restraint of the progress of myopia. (5 figures, 6 references)

Ray K. Daily.

Brueckner, A. **Stereoscopic effects in after-images.** Ophthalmologica **132**:57-59, July, 1956.

In after-images elicited by prolonged fixation of stereograms in a stereoscope the depth value is only partly retained and a good many of the finer details are missing altogether. A physiologic explanation of this loss in contents of the original sensation is attempted.

Peter C. Kronfeld.

Garrigosa, Cristobal. **Artificial aniseikonia.** Arch. Soc. oftal. hispano-am. **16**: 1111-1122, Oct., 1956.

This article is written by an industrial engineer. He points out that a difference in curvature between the lenses in the trial case and the lenses delivered to the patient may be the cause of an artificial aniseikonia, great enough to make the correction intolerable to the patient. A similar effect may be caused by a series of lenses of different curvatures and thickness. These statements are supported by a mathematical analysis. (3 figures, 1 table)

Ray K. Daily.

Kosinski, Werner. **Myopia as an ocular varicosity.** Klin. Monatsbl. f. Augenh. **130**:266-270, 1957.

Myopia is regarded as a predetermined insufficiency of the mesenchymal tissues, like a varicose dilatation of a vein.

Frederick C. Blodi.

Ogle, K. N. and Groch, J. **Stereopsis and unequal luminosities of the images in the two eyes.** A.M.A. Arch. Ophth. **56**: 878-895, Dec., 1956.

This study concerns the extent to which a difference in the luminosities of the images in the two eyes can affect binocular vision and depth perception. The authors conclude that these functions are not materially affected by disparate images. (7 figures, 2 tables, 25 references)

G. S. Tyner.

Simonelli, M. **Tolerance of correction in high anisometropia.** Gior. ital. oftal. **9**:355-358, May-June, 1956.

Five patients with anisometropia were made comfortable by wearing the full correction for each eye and submitting to orthoptic therapy. V. Tabone.

5

DIAGNOSIS AND THERAPY

Bertelsen, Torstein I. **The use of radiographic contrast media in diagnosing orbital tumors.** Acta Ophth. **34**:355-366, 1956.

The authors describe the technique of phlebography and pneumography of the orbit, and report several cases illustrating the value of these diagnostic procedures in the diagnosis of orbital neoplasms. They believe that these methods will replace carotid angiography which is seldom of value in orbital tumors and is more hazardous. (9 figures, 15 references)
Ray K. Daily.

Bettman, J. W. **A modification of the Friedenwald-Guyton ptosis operation.** A.M.A. Arch. Ophth. **56**:819-824, Dec., 1956.

The author has modified the original operation to decrease the incidence of late postoperative infection. This is accomplished by a new arrangement of sutures. The procedure is well illustrated and clearly described. (8 figures, 1 reference)
G. S. Tyner.

Bozzoli, Sandro. **Ophthalmoscopic signs in a case of sudden death.** Gior. ital. oftal. **9**:341-354, May-June, 1956.

The ocular findings in a case of rupture of the Sylvian artery followed by death are described. Stress is laid on the presence of papilledema and retinal hemorrhage in the preagonal stage. The pathology of cerebral aneurysms is discussed; the importance of early diagnosis in the efficacy of therapy is emphasized.
V. Tabone.

Carreras, B. and Galvez, J. **Bony changes following the digito-ocular phenomenon of Franceschetti.** Ophthalmologica **132**:36-38, July, 1956.

Infants and children with severe congenital ocular anomalies have the tendency of indenting or trying to indent their eyeball walls with their extended index fingers. In 1947 Franceschetti described this digito-ocular phenomenon in a case of bilateral congenital cataract due to German measles during the pregnancy. The child may derive some satisfaction from phosphenes if the usual external stimuli cannot penetrate. In the paper under review, deformation and atrophy of the upper orbital rim in an almost blind 27-year-old man is attributed to the habit, acquired in early childhood, of finger pressure against the globes. (4 figures, 3 references) Peter C. Kronfeld.

Donn, Anthony. **Effect of intravenous typhoid vaccine on plasma adrenal cortical steroids.** A.M.A. Arch. Ophth. **56**:825-829, Dec., 1956.

The author has correlated plasma steroid concentrations with rises in body temperature during fever therapy with typhoid vaccine. This study indicates that steroid levels are proportional to temperature rises and therefore suppression of the fever prevents this desirable adrenal activity. In this study no attempt was made, however, to correlate steroid levels with success of the vaccine therapy or to evaluate other physiologic responses to therapy. (2 charts, 2 tables, 8 references)
G. S. Tyner.

Fitzpatrick, T. B., Zeller, R., Kukita, A. and Kitamura, H. **Ocular and dermal melanocytosis.** A.M.A. Arch. Ophth. **56**: 830-832, Dec., 1956.

This is an abbreviated report of cases

reported in more detail elsewhere of "Naevus of Ota." The authors suggest a new term for the condition, "oculodermal melanocytosis." The entity consists of a pigmented lesion of the lids or adjacent skin, and ocular melanosis. It is a benign condition which should be differentiated from precancerous and cancerous melanosis of the conjunctiva, and congenital conjunctival naevi. (6 figures, 17 references)

G. S. Tyner.

Helmick, E. D. and Pringle, R. W. **Oculocutaneous melanosis or Naevus of Ota.** A.M.A. Arch. Ophth. **56**:833-838, Dec., 1956.

The authors report two cases of "Naevus of Ota" and propose the term "oculocutaneous melanosis." (9 figures, 6 references) G. S. Tyner.

Heyman, A., Karp, H. R. and Bloor, B. M. **Determination of retinal pressures in diagnosis of carotid artery occlusion.** Neurology **7**:97-104, Feb., 1957.

Ophthalmodynamometric measurement of the systolic and diastolic pressure of the central artery was made in normal subjects before and during sufficient compression of the common carotid artery to obliterate the superficial pulsation in the temporal artery and in patients with intracranial aneurysm whose carotid circulation was gradually occluded by a Crutchfield clamp, in patients with carotid occlusion by vascular disease, and also in patients with hemiplegia or dementia secondary to cerebral vascular disease. A drop of 25 to 30 percent in both systolic and diastolic pressure is diagnostic of impaired carotid circulation on the ipsilateral side. The test may also be used to evaluate the results of surgical interruption of the carotid vessels. (4 figures, 3 tables, 9 references)

Irwin E. Gaynon.

King, John Harry, Jr. **Experience with newer corticosteroid hormones in eye diseases.** Postgrad. Med. **21**:157-162, Feb., 1957.

Clinically, prednisolone is more potent than prednisone. A 0.5 percent suspension or ointment of prednisolone is effective in contact dermatitis, allergic blepharoconjunctivitis, vernal conjunctivitis, and mild episcleritis. Marginal ulcers of the cornea, superficial punctate keratitis, recurrent corneal erosion, syphilitic interstitial keratitis, and mild episcleritis respond to the 0.5 percent suspension. Nongranulomatous uveitis will respond to systemic prednisolone therapy. ACTH should be administered at weekly or biweekly intervals to prevent adrenal atrophy. (1 figure, 8 references) Irwin E. Gaynon.

Lederman, M. **Radiotherapy of non-malignant diseases of the eye.** Brit. J. Ophth. **41**:1-19, Jan., 1957.

Among the most common conditions of most importance in radiotherapy are Mooren's ulcer, rosacea keratitis, corneal vascularization, virus infections, vernal catarrh and pterygium. In the first two, radiation is recommended not as a treatment of last resort but rather as the treatment of choice. One uses X-ray irradiation which is given once or twice weekly for four weeks or beta irradiation with strontium or even, as is frequently done, a combination of the two. Complications such as exacerbation of symptoms, traumatic damage to the eye and radionecrosis can occur but if proper care is used these should not be encountered. (19 figures, 8 tables, 4 references) Morris Kaplan.

Lister, A. **Air in the eye.** Brit. J. Ophth. **41**:115-119, Feb., 1957.

The use of air injection into the eye is discussed; its advantages seem to outweigh its disadvantages and there are very few complications. In cataract extraction the anterior chamber is frequently refilled even before the procedure is completed but when the iris appears to

be crowded into the area of section, an injection of air is helpful. The complication which results from air being lodged behind the iris can be prevented by having the patient remain flat in bed after cataract extraction; the air then can rise through the pupil. Air should not be injected after loss of vitreous except through a small paracentesis made after tight closure of the wound. Anterior synechiae can be prevented in keratoplasty by injection of air; no displacement of the graft is to be feared if direct appositional sutures are used. In eyes with very shallow chambers an injection of air will facilitate the surgical procedure. The injection of air into the anterior chamber combined with a posterior sclerotomy in cases of flat chamber with choroidal detachment is well known. Air in the posterior chamber for retinal detachment surgery is strongly recommended, except when there is an exceptionally large tear.

The technique of air injection requires sterile air and a blunted No. 20 needle. The sterility of the air can be assured by autoclaving the syringe with air in it or by drawing air into the syringe through a flame or sterile cotton. Air may be injected through a small incision made for the purpose or through the lips of an existing wound. (4 references)

Lawrence L. Garner.

Galvez Montes, J. **The use of the hydrazide of isonicotinic acid in intraocular tuberculosis.** Arch. Soc. oftal. hispano-am. 16:1134-1136, Oct. 1956.

This is a tabulated report of 20 cases of choroidal and retinal tuberculosis treated with the hydrazide of isonicotinic acid; in ten cases streptomycin was also administered. The response to this therapy is more favorable when the diagnosis of tuberculosis is established than when it is presumptive. The results are better in cases in which the primary process is bacterial in origin, and the allergic manifestations secondary. In cases of iridocyclitis, where the predominant process is allergic in type, the bacteriostatic action of the drugs is of no value, and the drug may even increase the tendency to hemorrhage, because it prolongs the coagulation time. There was no effect in retinal periphlebitis with a more or less advanced retinitis proliferans consecutive to a vitreous hemorrhage. Ray K. Daily.

Pittar, C. A. **A new suture needle for corneal surgery.** Brit. J. Ophth. 41:60-61, Jan., 1957.

It is recommended that straight needles be used for fine corneal suturing rather than the conventional curved needle. It is felt that they can be used more easily with less trauma to the cornea and that they can be placed more accurately. Such a needle, 4 mm. long, and of 15-gauge wire, which has a diameter of 0.01 inches, has been used satisfactorily for eight or nine months. (1 figure, 1 reference)

Morris Kaplan.

Radzichowsky, B. **A new model of a trephine in corneo-scleral trephining and in posterior sclerectomy.** Vestnik oftal. 1:40-41, Jan.-Feb., 1957.

Radzichowsky modified Elliot's trephining operation by making two windows, 5 mm. high, so that the surgeon can, by looking through these holes, see the depth of the trephining, and where the scleral disc is not cut through.

Olga Sitchevska.

Schenk, H. and Rummelhardt, K. **The prevention of expulsive hemorrhages by venesection.** Ophthalmologica 132:39-56, July, 1956.

At the first University Eye Clinic in Vienna the incidence of expulsive hemorrhage after cataract extractions has been five in 4,094 consecutive operations. Three of these hemorrhages occurred despite

venesection just before the operation. The authors question the value of venesection as a blood pressure-lowering measure and recommend that it be replaced by ganglionic blocking drugs. (5 tables, 33 references) Peter C. Kronfeld.

Weigelin, E. **The measurement of the blood pressure in the eye.** Klin. Monatsbl. f. Augenh. **130**:145-154, 1957.

In this survey various methods and results of ophthalmodynamometry are first discussed. Its simplicity makes it still the most favored instrument though the angiotonometer of Baurmann has some theoretical advantages. We must be aware of the fact that all we can measure is the blood pressure in the (ophthalmic) artery just upstream from the disc. Pressure measurements on the episcleral veins have become quite popular during the last years. Similar measurements on the episcleral arteries are more difficult.

Ophthalmodynamometry is absolutely unreliable for evaluating the retinal vascular system, but it gives us a good clue to the intracranial vascular system. This method can be used in occlusion or thrombosis of the internal carotid, in cerebral arteriosclerosis, in hypertension and in vasomotor headaches. (24 references)

Frederick C. Blodi.

6

OCULAR MOTILITY

Horwich, Harry. **Early management of the "cross-eyed" individual—its importance and application to the military establishment.** Military Med. **120**:93-98, Feb., 1957.

The author states that in his military clinic strabismus is more common than all other eye diseases combined and is the chief cause of blindness. He feels that this is due to an alertness of military parents to physical defects in their offspring. He emphasizes the need for early treatment and gives a general outline for management of strabismus in children.

David Shoch.

Malbrán, J. **Orthoptics and orthoptic technicians.** Arch. oftal. Buenos Aires **31**: 275-284, Nov., 1956.

This paper discusses the scope and limitations of orthoptic treatment in cases of strabismus and allied conditions. Common mistakes are reviewed and special emphasis is laid on the fact that the final diagnostic evaluation of any given case must fall back on the ophthalmologist himself, as must also all precise directions regarding the training eventually needed. It is worth nothing that Jaensch and Cüppers have recently exposed strong views on this latter point.

A. Urrets-Zavalia, Jr.

Malbran, E. and Norbis, A. **The diagnosis of paralytic deviations.** Arch. Soc. oftal. hispano-am. **16**:1087-1110, Oct., 1956.

The diagnostic difficulties of paralytic strabismus are discussed in detail. It is pointed out that vertical deviations associated with horizontal deviations often diagnosed as paralytic in origin, may be due in reality to the dissociation of fixation as pointed out by Urist, or to a disturbance in the development of optomotor reflexes as described by Crone. It is also pointed out that torticollis is not always the consequence of a paralytic deviation. The motor disturbance secondary to the paralysis, such as hyperfunction and contractures of the contralateral synergists and the homolateral antagonists not only add to the difficulty of the diagnosis, but also mask the paralysis. The secondary sensory disturbances, such as amblyopia, and abnormal correspondence also create diagnostic pitfalls. A diagnostic pattern is described and the solution of the difficulties illustrated with reports of cases. The diagnostic pattern consists of a his-

tory, objective tests, subjective tests and auxiliary examinations. The tests and the significance of the data are discussed in detail. (10 figures, 75 references)

Ray K. Daily.

7

CONJUNCTIVA, CORNEA, SCLERA

Agarwal, L. P., Agarwal, G. C. and Chadha, V. P. **Conjunctival smear cytology in phlyctenular ophthalmia.** Ophthalmologica **132**:21-26, July, 1956.

Smears taken from the tarsal conjunctiva in acute phlyctenular disease contain more polyhedral, cuboidal and goblet (epithelial) cells than those of normal controls. Persistence of the abnormal cell picture in a clinically cured case should lead one to expect an early recurrence and therefore calls for continuation of therapy until the smear becomes normal. Of exudative cells the authors find polymorphonuclears, monocytes and lymphocytes, with a striking preponderance of the first named in the cases of secondary bacterial infection. Riboflavin in doses of 10 mg. intramuscularly lowers the rate of recurrences. (6 figures, 2 tables, 8 references)

Peter C. Kronfeld.

Andreani, D. and Capalbi, S. **Comparative effect of Prednisone and cortisone on corneal vascularization.** Gior. ital. oftal. **9**:418-428, May-June, 1956.

Experiments on 18 rabbits showed that Prednisone and cortisone have a powerful effect in causing regression of corneal vascularization which was artificially produced and that Prednisone was quicker acting. (10 figures, 13 references)

V. Tabone.

Araslanova, S. and Krilova, A. **The role of hypovitaminosis C in the pathogenesis of some forms of chronic conjunctivitis.** Vestnik oftal. **1**:20-23, Jan.-Feb., 1957.

The study of patients with chronic conjunctivitis during a number of years showed that a peak occurs during the winter and spring months, when the reserve of ascorbic acid is at a low level. Sixty-two young men with chronic conjunctivitis for one to three years were studied. They complained of burning, tearing, photophobia. The usual therapeutic measures were not effective. The bacteriologic examination showed no microbes. The daily excretion in the urine of ascorbic acid was measured. The ascorbic acid content of the blood was within 0.3 to 0.7 mg. percent in 23 patients. Intravenous injections of ascorbic acid with glucose and oral vitamin C in large doses were given; multivitamins and cod liver oil were given in addition in the more severe cases. There was marked objective and subjective improvement in all patients who were followed from one to two years.

The authors believe that hypovitaminosis C disturbs the synthesis of such intercellular substances as collagen and procollagen; this leads to increased permeability of the capillaries supplying the conjunctiva and also to loosening of the cellular elements of the conjunctiva itself. (1 table)

Olga Sitchevska.

Bellavia, Marco. **Corneal involvement in premenstrual syndrome.** Gior. ital. oftal. **9**:394-417, May-June, 1956.

Three cases of corneal infiltration and inflammation recurring before the menstrual period are described. Similar cases in the literature are reviewed and the probable pathology discussed. The view is expressed that the ocular lesion is probably due to a disturbance of balance of ovarian secretion and to an allergic factor. The endocrine disturbance may be secondary to hepatic dysfunction. The patients were given the usual local applications and in addition they were given vitamin B_{12} generally and locally. The latter also influenced the ocular manifesta-

tions favorably when given prophylactically. (1 figure, 23 references)

V. Tabone.

Bobrova, E. **The treatment of tuberculosis of the conjunctiva.** Vestnik oftal. 1: 15-19, Jan.-Feb., 1957.

During the years 1953 to 1955, five patients with tuberculosis of the conjunctiva were treated in the hospital of the Woroniesh Medical Institute; one patient with tuberculous blepharitis was treated in the clinic. The tuberculous process of the conjunctiva was unilateral and in one patient it spread to the sclera. In four patients the diagnosis was confirmed by biopsy. The age of the patients varied from 9 to 38 years. In two patients, the regional (submaxillary and parotid) lymph nodes were enlarged.

Tuberculosis of the conjunctiva usually develops as a result of the hematogenous transfer of tubercle bacilli from the primary focus; streptomycin injections with Pask (Pas), good nutrition, polyvitamins were given for the improvement of the general condition of the patients. Subconjunctival injections of chlor-calcium streptomycin were also given in the fornix, 50,000 units in adults and 25,000 units in children. Streptomycin was also introduced by iontophoresis. Local therapy in the form of streptomycin drops was given on the days when the injections were omitted. In all, the patients received from one half to two million units during the course of treatment. The regression of the process required from six weeks to four months. The hyperemia and infiltration of the conjunctiva and the tuberculous nodes disappeared, fine scars formed at the site of the ulceration and the swelling of the lymph nodes also disappeared. There was no recurrence of the process.

Olga Sitchevska.

Gilkes, M. **Leech-bite of the cornea.** Brit. J. Ophth. 41:124-125, Feb., 1957.

A single case of painful red eye is described which was noted in an Arab woman who had washed her face shortly before in a nearby hillside spring in Jordan. Closer examination revealed a mass suggestive of uveal tissue but which was in reality a leech adherent at the limbus. Removal with forceps was unsuccessful but instillation of 5 percent saline solution resulted in immediate falling off of the object. Healing was uneventful. (1 figure, 2 references)

Lawrence L. Garner.

Jacobs, H. B. **Posterior conical cornea.** Brit. J. Ophth. 41:31-39, Jan., 1957.

Posterior conical cornea has been reported rather infrequently and is not to be confused with the usual conical cornea. Two forms of the condition occur: localized or keratoconus posticus circumscriptus and generalized or keratoconus posticus totalis. Seven cases of the former have been reported to which nine more are added and three cases of the latter have been recorded to which one is added. Little is known of the cause of the localized lesion although some natal or neonatal trauma to Descemet's membrane or to the endothelium could well be the cause. It is also true that a developmental defect in these membranes might well be a causative factor. Most of the cases presented are most probably congenital and two are familial.

In the cases of generalized disturbance all patients had a long history of poor vision which could not be improved with glasses. All presented a normal anterior corneal surface and all cases were in females. (5 figures, 9 references)

Morris Kaplan.

Jacobs, H. B. **Traumatic keratoconus posticus.** Brit. J. Ophth. 41:40-41, Jan., 1957.

A 46-year-old man noted floating opacities in the left eye which was found to be normal. There was history of injury to the right eye with resultant poor vision of 6/36. Examina-

tion revealed two adjacent nebulae with an increased concavity of the posterior corneal surface behind one of them, where torn fragments of Descemet's membrane projected into the aqueous. It was unmistakably a case of traumatic posterior conical cornea. (3 figures, 1 reference) Morris Kaplan.

Lepri, Josef. **Reticuloendothelioses with conjunctival involvement.** Klin. Monatsbl. f. Augenh. **130**:163-175, 1956.

A 50-year-old man experienced generalized swelling of the lymph nodes, splenomegaly and anemia. Fleshy tumors developed on the bulbar conjunctiva. Histologic examination showed that this was a generalized hyperplasia of the reticulo-endothelial system, with beginning sarcomatous degeneration. (8 figures, 28 references) Frederick C. Blodi.

Palich-Szanto, O. **Conjunctival cysts.** Ophthalmologica **132**:13-20, July, 1956.

In five cases the appearance of multiple small cysts in the otherwise normal bulbar conjunctiva was associated with intensive itching, burning and neuralgic pain. On topical privine therapy all symptoms cleared up promptly in all but one case. A herpetic etiology is considered. (6 figures, 10 references) Peter C. Kronfeld.

Sinitsin, B. **Transplantation of catgut under the conjunctiva in the treatment of trachomatous pannus.** Vestnik oftal. 1:25-27. Jan.-Feb., 1957.

132 patients with trachomatous pannus were operated on successfully at the clinic of Nukus. Catgut folded double, about 15 mm. long, is introduced under the conjunctiva by a needle about 2 to 5 mm. above the limbus. Cytomycin therapy is applied. If the pannus is heavy, an additional peritomy can be done. The granulation roll about the implant diverts the blood vessels from the cornea, so that they become obliterated and the cornea clears. The catgut implants act as tissue therapy. The method is simple and can be done in the clinic. Olga Sitchevska.

Voinova, T., Zatzepina, N. and Musina, A. **The use of terramycin in trachoma.** Vestnik oftal. 1:10-15, Jan.-Feb., 1957.

At the Helmholtz Scientific Experimental Institute in the Mordva region, terramycin was applied topically in 200 trachomatous patients for two to eight weeks spent in the hospital. They were then observed in the clinic from 6 to 12 months. Chlorhydrate 0.5 percent and 1 percent and terramycin 1 percent were used in the form of drops and ointment. In some, the treatment was given three or six times daily in combination with expression and massage of the follicles and in some the expression and massage were omitted. In the scrapings from the conjunctiva, Prowazec's corpuscles were found in 16 patients; these disappeared after a few days of treatment with terramycin. The best results were obtained in treatment in the initial stage of trachoma and also in light forms of stages 2 and 3. During one year 116 patients were cured and 169 were improved. The best results were observed with six daily applications of this antibiotic. Expression and massage of the follicles increased the effectiveness of terramycin and accelerated the process of healing.

Olga Sitchevska.

Volkor, V. **Argyrosis of unusual origin.** Vestnik oftal. 1:41-42, Jan.-Feb., 1957.

A woman, aged 75 years, had glaucoma and bilateral cataract. A 3 percent solution of potassium iodide and one of 10 percent furamon were instilled into the conjunctival sac. After a time the lower fornix and the lower part of the conjunctiva became dark. The slitlamp showed an accumulation of brown, dark granules under the epithelium of the conjunctiva. The patient had used a silver spoon for the instillation of the drops instead of a dropper. The solution presumably formed silver iodide

which was evidently absorbed under the epithelium and reduced into small black granules. Olga Sitchevska.

Weber, J. and Strohbusch, H. **Predominantly unilateral vernal catarrh.** Klin. Monatsbl. f. Augenh. 130:259-262, 1957.

This occurred in a 13-year-old boy and could be observed through several years. The conjunctival granulations caused a considerable astigmatism. All kinds of treatment were of no avail. (3 figures, 9 references) Frederick C. Blodi.

8

UVEA, SYMPATHETIC DISEASE, AQUEOUS

Green, M. F. and Kennedy, R. J. **Ocular manifestations of sarcoidosis.** Cleveland Cl. Quart. 24:1, 10-16, Jan., 1957.

Fifty percent of the cases of sarcoidosis are associated with ocular manifestations, most of which occur in the uveal tract. Sarcoidosis should be suspected in all cases of granulomatous iritis with a negative tuberculin reaction. The Kveim test, study of the plasma proteins, chest X ray and blood count should be done. Isoniazid and cortisone offer the best therapy at present. The local application of cortisone and atropine controls sarcoid iritis. (1 table, 16 references) Irwin E. Gaynon.

Levy, W. J. **Congenital iris lesion.** Brit. J. Ophth. 41:120-123, Feb., 1957.

An unusual case of persistent pupillary membrane is reported which was associated with a reduplication of the anterior layer of the pigmented mesoderm. A pseudopupil was noted, but without function, while an underlying atrophic iris functioned normally. Surgical removal was performed by placing the pupils in miosis which resulted in an anterior displacement of the pseudopupil. A keratome incision was then made in the 12 o'clock position and the membrane grasped. It was very easily pulled away but a complete superior iridectomy resulted in each eye. Recovery was uneventful with a marked improvement in vision. (4 figures) Lawrence L. Garner.

Maggiore, Luigi. **Glaucomatous manifestations of choroidal tumors.** Arch. Soc. oftal. hispano-am. 16:1069-1086, Oct., 1956.

To clarify the genesis of the glaucomas in eyes with choroidal tumors, the authors examined histologically nine eyeballs containing choroidal melanomas of various sizes and shapes. In three of these evidence of glaucomatous change was found. The history of these nine cases are briefly reported. The six eyeballs without evidence of glaucomatous change had partial or total detachment of the retina, and the retina adhered to the inner surface of the tumor. The subretinal space was either empty or filled with an albuminous fluid without cellular elements. In one case the anterior chamber was also filled with an albuminous fluid and the surface of the iris was covered with the same substance. In none of these globes was there evidence of an inflammatory process in the anterior uvea. It appears that neither the size nor the shape of the choroidal melanoma are factors in the genesis of glaucoma. In the three eyes with evidence of glaucomatous change the tumors occupied the papillary region and extended over the lamina cribrosa; the retina was completely detached and projected far into the vitreous close to the posterior surface of the lens. One case had evidence of an intense inflammatory granulomatous process which produced occlusion and seclusion of the pupil; in this eyeball the subretinal space was filled with a fibrinous exudate containing red and pigmented cells; the same type of exudate was present in the anterior chamber. Bibliographic data are in accord on the capacity of the tumor to produce in-

flammatory phenomena. They are not in accord as to significance of these phenomena in the genesis of glaucoma. The process common to the three globes with glaucoma was the extension of the tumor into the optic nerve, blocking the exit of intraocular fluid through this channel. It appears from the data of this investigation that in some cases the tumor produces an inflammatory reaction of the uvea, which may give rise to the glaucomatous process. The detachment per se as a cause of the glaucomatous changes is not supported by the histologic data. The author believes that the involvement of the optic nerve by neoplasm, blocking the posterior drainage of the endocular fluid, may cause a glaucomatous process by the retention of the fluid. This process may be initiated not only by the blockage of the vortex veins, but even to a greater extent by the blockage of the drainage through the optic papilla. (9 figures) Ray K. Daily.

Mayer, F. W. **Balneotherapy of chronic recurrent uveitis.** Klin. Monatsbl. f. Augenh. **130**:252-259, 1957.

Sulfur baths and mud packs may be of advantage. (8 references)

Frederick C. Blodi.

Miller, R. K. and Smerz, A. **Bilateral posterior uveitis complicating a positive tuberculin cutaneous reaction.** A.M.A. Arch. Ophth. **56**:896-897, Dec., 1956.

A case is reported in which bilateral uveitis was precipitated by a cutaneous tuberculin test. (2 references)

G. S. Tyner.

Pintos Castro, Camilo. **A case of ossification of the choroid.** Arch. Soc. oftal. hispano-am. **16**:1145-1155, Oct., 1956.

In the course of an evisceration of a painful eyeball the author encountered a bony mass filling the globe. The mass was extracted in toto and sectioned histologically and found to represent an ossification of the choroid. The literature on the genesis of this process is reviewed, and it is emphasized that a definite diagnosis can be established only by X-ray examination. (5 figures) Ray K. Daily.

9

GLAUCOMA AND OCULAR TENSION

Becker, Bernard. **Glaucoma, 1955-1956.** A.M.A. Arch. Ophth. **56**:898-956, Dec., 1956.

The author has confined his report to an informative discussion of selected concepts rather than a detailed abstraction of the year's literature. The topics discussed include the facility of aqueous outflow, the rate of formation of the aqueous humor, episcleral venous pressure, and miscellaneous glaucoma topics. (667 references) G. S. Tyner.

van Beuningen, E. G. A. and Fischer, F. W. **Tonography. Its role in clinical ophthalmology.** Arch. f. Ophth. **158**:297-302, 1957.

The authors state that during tonography glaucomatous eyes show smaller elastic changes than normal and preglaucomatous eyes. The elastic changes affect the outflow resistance. The estimate of the outflow volume becomes doubtful. The authors tried to overcome this difficulty and succeeded in a number of cases in combining tonographic measurements with those of blood pressure in the aqueous veins. From these data volume changes per minute could be calculated. However, determination of the venous blood pressure often proved to be very difficult, therefore the authors tried to combine Goldman's quantitative fluorometry with tonographic measurements. This work is still in progress and will be reported as soon as the results of both procedures are comparable. (5 figures, 12 references) Ernst Schmerl.

Burton, Edwin W. **Glaucomatocyclitic crises.** South. M. J. 50:2, 257-258, Feb., 1957.

This disease is unilateral. The pupil may be dilated. The eye is white, or, if the tension is very high, a mild congestion is present. Nonpigmented posterior corneal precipitates are found and a positive aqueous flare is present. The angle is open. Aqueous outflow is reduced during the attack. Each episode lasts about two weeks. After the attack subsides, the corneal precipitates gradually disappear. Interval provocative tests are negative. (5 references) Irwin E. Gaynon.

Niedermeier, Siegfried. **The vasogenic factors in glaucoma.** Arch. f. Ophth. 158: 303-309, 1957.

Increase in volume of the choroid on the basis of neurovascular disturbances is considered a major factor in the pathogenesis of glaucoma. (2 figures, 16 references) Ernst Schmerl.

Paiva, C. **Five-years experience with iridencleisis.** Arq. brasil. de oftal. 19:101-113, 1956.

The author reports his observations in almost 200 cases of primary simple glaucoma treated by iridencleisis in five years. About 90 percent of the patients so treated had a normal tension, varying between 15 and 22 mm. Hg. The author's technique is as follows. After placing a superior rectus suture, a conjunctival flap is dissected 8 to 10 mm. above the limbus, including Tenon's capsule, baring the sclera down to the corneal limbus. A scleral incision 3 to 4 mm. wide is made with a keratome, beginning 2 mm. above the limbus and bisecting the iridocorneal angle. The iris is grasped near the pupillary margin and withdrawn until the edge of the pupil appears in the wound. A radial iridotomy is made and the iris pillars remain in the angles of the wound with the pigmented surface everted. The conjunctival flap is sutured and atropine is instilled. The dressing is removed in 48 hours, and the eye is massaged if there is no filtering bleb present. Postoperative iritis is rare, and the anterior chamber is almost always reformed early. Some complications which have occurred are hemorrhage, rupture of the iris, retraction of the iris into the anterior chamber, iritis, delayed formation of the anterior chamber, return of the hypertension and sympathetic ophthalmia but not hypotony. The author stresses its value in primary simple glaucoma and its freedom from complications. (9 figures, 15 references) James W. Brennan.

Panina, N. **The practical value of prophylactic examinations for glaucoma.** Vestnik oftal. 1:3-5, Jan.-Feb., 1957.

204 workers of a Leningrad factory, aged from 40 to 70 years, were given tests for glaucoma; of these, three had initial glaucoma and 26 were suspected of having glaucoma. In the latter group, visual fields, elastotonometry, the water drinking test and the daily variations of the intraocular tension were carefully noted and the tests were repeated whenever the diagnosis was doubtful. Any person with questionable glaucoma should be hospitalized for evaluation of the findings. Olga Sitchevska.

Rohrschneider, W. and Bauermann, H. **Unilateral simple glaucoma after trauma.** Klin. Monatsbl. f. Augenh. 130:189-200, 1957.

A chronic open-angle glaucoma in only one eye was followed in each of 22 patients in the Eye Clinic at Munich. Eight patients gave a history of a blunt trauma to the eye or the head preceding the onset of glaucoma. These eight patients did not differ in any way from the other unilateral cases and D'Ombrain's assumption that most cases of unilateral open-angle

glaucoma are due to trauma could not be substantiated. (1 table, 21 references)

Frederick C. Blodi.

Sautter, H. **A classification of primary glaucoma.** Klin. Monatsbl. f. Augenh. **130**: 200-208, 1957.

The author believes that in some patients the peaks of the diurnal curve are emotionally determined. In arteriosclerotic patients the curve remains flat. (9 figures, 7 references)

Frederick C. Blodi.

Scheie, H. G., Spencer, R. W. and Helmick, E. D. **Tonography in the clinical management of glaucoma.** A.M.A. Arch. Ophth. **56**:797-818, Dec., 1956.

Tonography, while an important research tool, is of limited value in the clinical management of glaucoma. It is of less diagnostic value than the water drinking test for primary, open-angle glaucoma. The C value is not a reliable criterion of success of the medical treatment. (10 figures, 5 tables, 26 references)

G. S. Tyner.

Waisfeld, D. and Katzman, M. **The role of the cortex of the hemispheres in unconditional reflex regulation of intraocular pressure.** Vestnik oftal. **1**:8-10, Jan.-Feb., 1957.

Clinical observation was made on 25 patients who had a vascular, traumatic or inflammatory lesion of the cortex of the cerebral hemispheres. Elastotonometry was done on both sides, two to three times daily, at the same hour. It was found that there was an increase of the intraocular pressure on the side opposite to the brain lesion. These findings led to these conclusions: 1. there is an asymmetry of the ocular tension in a unilateral cortical lesion caused by the increase of the tension on the opposite side, 2. this asymmetry disappears as the lesion regresses, or it is more marked if the lesion spreads, and 3. the cortex of the hemispheres influences the unconditional reflex regulation of the ocular tension. Several case histories illustrate the author's findings.

Olga Sitchevska.

10

CRYSTALLINE LENS

Senà, J. A. and Malamud, B. **Extraction of an anteriorly luxated lens by means of a harpooning maneuver.** Arch. oftal. Buenos Aires **31**:297-300, Nov., 1956.

A 33-year-old man, known to have congenital bilateral ectopia lentis of hereditary character, presented a sudden hypertensive crisis in the right eye, following an unwarranted instillation of some mydriatic drops. The lens was found to be luxated into the anterior chamber, and the pupil, which was widely dilated, did not contract in response to miotic administration. As it was feared that a backward displacement of the lens might result from any attempt at its removal, a sharp, 4 cm. sewing needle was thrust through the limbus at 9 o'clock and pushed through the lens and then again through the limbus at an opposite point. A limbal section of adequate length was made with keratome and scissors and a spoon inserted behind the lens while the anchoring needle was gently withdrawn. An intracapsular extraction could then be performed without vitreous loss. The wound was closed with three preplaced corneal scleral sutures. Final vision, with a +11 sphere, was 20/30 minus. (1 figure)

A. Urrets-Zavalía, Jr.

Vetter, Georg. **Bilateral retinal detachment in syndermatotic cataract.** Klin. Monatsbl. f. Augenh. **130**:264-265, 1957.

A 17-year-old girl with neurodermatitis developed bilateral cataract and retinal detachment. The final vision (5/50) was better in the eye that had first the dia-

thermy and then the extraction than in the other eye (1/35) which had first the extraction and then the diathermy.

Frederick C. Blodi.

11

RETINA AND VITREOUS

Berrettini, G. L. and Aulicino, A. **Retrolental fibroplasia. A case in an acute phase, treated with cortisone.** Arq. brasil. de oftal. **19**:114-126, 1956.

A two-and-one-half-months old infant with retrolental fibroplasia was given cortisone for two weeks. It was premature, birth weight 2100 gm., had been in an incubator in a high oxygen concentration, and had multiple hemangiomas, and edema of the retina, increasing toward the periphery.

Side effects of the drug were observed, such as glycosuria, generalized edema, excitability, furunculosis and pharyngitis. These subsided promptly upon cessation of the use of the drug. Repeated examinations showed gradual improvement in the fundus lesions, disappearance of the edematous infiltrate and also of the hemangiomas. After six months, the fundi were considered to be normal. A total of 246 mg. of cortisone had been administered. (17 references)

James W. Brennan.

Charters, A. D. **Retinitis pigmentosa and Gaucher's disease.** Brit. J. Ophth. **41**: 54-59, Jan., 1957.

A 38-year-old man had had his spleen removed for Gaucher's disease. It was felt that he was cured despite the steady enlargement of his liver through the years. At the age of 22 years he began to notice reduced vision and night blindness, both of which progressed steadily to very poor vision with particular loss of peripheral vision. He was believed to have progressive retinitis pigmentosa and was given large doses of vitamin A.

Gaucher's disease and retinitis pigmentosa are compared; there may be altered lipoid or cholesterol metabolism in each, with alteration of pigmentation and of vitamin A metabolism. In this particular case it is possible that the retinitis pigmentosa might well have followed defective vitamin A metabolism resulting from the primary defective hepatic function. (1 figure, 34 references) Morris Kaplan.

Faldi, S. and Miani, P. **Retinal changes in Hodgkin's disease.** Gior. ital. oftal. **9**: 389-393, May-June, 1956.

Bilateral preretinal hemorrhage was observed in a case of Hodgkin's disease; the patient also had a diminution of the blood platelets and splenomegaly. Thirteen other patients with the same disease, but without enlargement of the spleen and reduction in the platelet count, did not show any retinal changes. (35 references)

V. Tabone.

François, J., Rabaey, M., Evens, L. and de Vos, E. **Pathologic study of a case of Coats' retinitis, probably due to toxoplasmosis.** Ophthalmologica **132**:1-12, July, 1956.

A yellowish mass in the fundus of the exotropic right eye of a three-year-old girl presented the problem of differential diagnosis between retinoblastoma and Coats' external exudative retinitis. Since, in either case, there was no hope of regaining or retaining useful vision, the eye was enucleated. The pathologic substrate of the yellowish mass seen with the ophthalmoscope was a fibrous pseudotumor located between pigment epithelium and retina proper and surrounded by cellular debris, cholesterol crystals and ghost cells. The retina showed severe degeneration in the region of the pseudotumor and less severe degenerative alterations in the periphery. The latter, less advanced lesions suggested a primary angiomatosis as

the basis of the disease. Repeated Sabin-Feldman dye tests for toxoplasmosis yielded titers up to 1 to 512. The possibility of a toxoplasmic etiology of Coats' disease is being considered. (8 figures, 18 references) Peter C. Kronfeld.

Schenk, H. and Pfeifer, H. **Visual fields and dark adaptation in senile pigmentary degeneration of the retina.** Arch. f. Ophth. **158**:326-333, 1957.

In 100 persons over 60 years of age the authors found 12 people showing pigmentary changes along the equators of both eyes. In four out of the 12 patients the visual field and adaptation to light were studied. Nothing abnormal could be found except an inversion of the color fields. (8 figures, 13 references) Ernst Schmerl.

Zamorani, Giorgio. **Association of Coats' retinopathy and retinitis pigmentosa.** Gior. ital. oftal. **9**:429-445, May-June, 1956.

A patient is described, showing the rare association of Coats' retinopathy and retinitis pigmentosa; the various theories of origin of both diseases are reviewed and discussed, and emphasis is laid on disturbance of the secretion of endocrine glands. It was observed that there was a disturbance of fat metabolism in this case and this leads the author to postulate for the pituitary a major role in the development of this syndrome. (1 figure, 39 references) V. Tabone.

Zaverucha, A. **Angioid streaks of the fundus, associated with pseudoxanthoma elasticum.** Arq. brasil. de oftal. **19**:141-142, 1956.

This is a series of fundus photographs illustrating angioid streaks. It is a supplement to the article in a previous issue of this journal, previously abstracted. (11 figures) James W. Brennan.

12

OPTIC NERVE AND CHIASM

Alajmo, B. **Optic nerve lesions in tuberculous meningitis.** Gior. ital. oftal. **9**:465-478, July-Aug., 1956.

The clinical aspects of optic nerve lesions in tuberculous meningitis are reviewed and discussed, and reference is made to recent literature on the subject. Modern therapy is discussed and stress is laid on the value of associating cortisone with antibiotics and of the use of suboccipital local therapy in addition to parenteral administration of drugs. (36 references) V. Tabone.

Esente, I. and d'Aprile, V. **Neonatal pseudoatrophy.** Gior. ital. oftal. **9**:493-497, July-Aug., 1956.

The authors describe a case of pseudoatrophy of the optic discs (Beauvieux's syndrome). The patient was a girl born at term who died of a generalized infection when 18 months old. She showed defective pigmentation of the choroid as well as defective development of the neuromotor mechanism. Her father had persistent pupillary membrane. (1 figure, 7 references) V. Tabone.

Pallares, J. **Comments on the etiology, pathogenesis, and treatment of optic neuritis of unknown origin.** Arch. Soc. oftal. hispano-am. **16**:1123-1133, Oct., 1956.

The author attributes optic neuritis, heretofore described as of unknown etiology, to a virus infection extending from the nose into the eye through the posterior paranasal sinuses. He considers the process to be similar to the spontaneous facial paralysis attributed to a cold, in which the infection spreads to the facial nerve by way of the Eustachian canal. He reports the case of a patient who had acute retrobulbar neuritis associated with a facial paralysis on the same side. The brusk onset and the acute symptoms are

caused by the compression of the nerves within the osseous canal. The author advises the administration of cortisone compounds, for their antiinflammatory effect, in addition to the parenteral administration of colloidal sulphur. (1 figure)

Ray K. Daily.

Schirmer, R. **Ophthalmic herpes zoster with affection of the optic nerve.** Klin. Monatsbl. f. Augenh. 130:262-264, 1957.

A 77-year-old man developed, in the course of herpes zoster, an ipsilateral papilledema which ended in a secondary optic atrophy. (1 reference)

Frederick C. Blodi.

13

NEURO-OPHTHALMOLOGY

Miani, Paolo. **Visual and pupillomotor fibers in the optic nerve.** Gior. ital. oftal. 9:444-449, May-June, 1956.

A patient is described who, after injury, had one-sided mydriasis with absence of the direct light reflex and retention of the consensual reflex; this eye also had partial optic atrophy, retention of moderate vision and reduction of the temporal visual field. The literature on the presence of separate visual and afferent pupillomotor fibers in the optic nerve is reviewed and discussed. There probably are separate afferent pupillomotor fibers at least in the nasal half of the optic nerve. (1 figure, 17 references) V. Tabone.

Parsons, O. A. and Miller, P. N. **Flicker fusion thresholds in multiple sclerosis.** Arch. Neurol. & Psychiat. 77:134-139, Feb., 1957.

The authors confirmed previous work by Miles that flicker fusion frequency is reduced in multiple sclerosis even between episodes of retrobulbar neuritis. Flicker fusion tests were found practical and useful in evaluating the extent of disease. The fusion rate of twenty male patients with multiple sclerosis averaged 29.77 in multiple sclerosis compared to 40.23 in 20 controls. Those patients with disc pallor showed further reduction of flicker fusion rate. (5 tables, 16 references)

Paul W. Miles.

14

EYEBALL, ORBIT, SINUSES

Bäfverstedt, B., Lundmark, C., Mossberg, H. and Stenbeck, A. **Benign orbital lymphadenosis.** Acta Ophth. 34:367-376, 1956.

The authors propose the name "benign orbital lymphadenosis for benign lymphoid tumors of the orbit. Orbital neoplasms of this type have been reported in the literature under a variety of names, and there is still some disagreement as to their benign or malignant nature. The literature is reviewed and a case reported. The patient, a man 53 years old, had bilateral, but not symmetrical orbitopalpebral lymphomatosis. The process ran a protracted course, and it was 13 years before exophthamos developed and the diagnosis was established. The diagnosis was made by biopsy of the tissue of the right lower lid, and the patient recovered promptly under X-ray irradiation. (6 figures, 11 refences) Ray K. Daily.

Balza, J. F. and Grimberg, J. **Supernumerary teeth located in the orbit.** Arch. oftal. Buenos Aires 31:285-287, Nov., 1956.

Tumors or cysts derived from the embryonic tegumentary layers are relatively common in the region of the orbit; they occur in any position along the cranial sutures and result from early dermal inclusions. Only exceptionally, however, have they been found to contain recognizable odontoid structures. The case of a 17-year-old girl is reported, where a slowly growing, hard mass could be felt at the nasal third of the lower orbital border, to which it was adherent. An an-

terior orbitotomy disclosed the presence of two well-developed teeth, one of which was firmly implanted in the bone and had to be removed with the aid of a dental forceps. (2 figures, 4 references)

A. Urrets-Zavalia, Jr.

Converse, J. M. and Smith, B. **Enophthalmus and diplopia in fractures of the orbital floor.** Brit. J. Plastic Surg. **9**:265-274, Jan., 1957.

Comminuted fractures of the orbital floor can be caused by backward displacement of the orbital rim or by the increased internal orbital pressure caused by a blow on the soft tissues (blow-out) on the thin floor of the orbit without affecting the orbital margin. Gravity, edema, hemorrhage, and displaced orbital fat cause a displacement of the orbital contents into the maxillary sinus. Enophthalmus is due to an enlargement of the orbital cavity. Limitation of elevation and depression is due mainly to fixation of the tissues enveloping the inferior rectus and the inferior oblique muscle sheaths by incarceration and herniation between the bony fragments. This must be repaired by an iliac bone graft to the floor of the orbit under direct vision, instead of by packing the maxillary sinus. The technique is described. (4 figures, 6 references)

Irwin E. Gaynon.

Simonelli, Mario. **Ageing of the eye.** Gior. ital. oftal. **9**:479-492, July-Aug., 1956.

The manifestations of senility of the eye are reviewed. V. Tabone.

Sirois, Jean. **Cerebral arteriovenous fistula or pulsating exophthalmos.** Laval Med. **22**:25-44. Jan., 1957.

This is the last of a series of papers dealing with intracranial vascular disease amenable to surgery. The author points out that pulsating exophthalmos results from the rupture of an aneurysm of the internal carotid artery within the cavernous sinus. The presence of an aneurysm will cause symptoms which vary with the location of the aneurysm within the sinus. In all cases the diagnosis is finally made by arteriography. An aneurysm may thrombose, calcify or rupture. It is the latter event that gives rise to pulsating exophthalmos.

The author feels that the treatment of choice for this complication is ligation of the common carotid artery; if this does not suffice, the internal carotid can then be ligated intracranially. Three cases are reported in detail, in all of which therapy was successful. (6 figures, 13 references)

David Shoch.

15

EYELIDS, LACRIMAL APPARATUS

Ambos, E. **A simplified technique for inserting lacrimal probes from the nose.** Klin. Monatsbl. f. Augenh. **130**:249-252, 1957.

A hollow probe is inserted from the eye. This probe contains a nylon thread and has a slitlike opening. A loop of this thread will appear at the nares and can be used as a guide for retrograde probing. (4 figures, 15 references)

Frederick C. Blodi.

Björk, Harry. **Dacryocystorhinostomy; rhinological aspect.** Acta Ophth. **34**:404-411, 1956.

This is a report of impressions based on an analysis of 124 cases of intranasal dacryocystorhinostomy; in 62 surgery was performed between 1940 and 1947, and followed by a questionnaire at the end of 1947 and 62 operations were performed since 1948. The results of the second series were consistently better because of the experience gained in the first series. Results were satisfactory in 59 percent of patients in the first series, and in 97 percent in the second series. The author stresses the importance of preop-

erative examination of the nose. In his experience the apparent cause of dacryostenosis is revealed by a rhinological examination in only 10 to 20 percent of the patients and the cause usually is ozena, lupus, tumor, or trauma. Good results are easier to obtain in suppurative dacryocystitis than in dacryostenosis without suppuration. Prolonged and intensive probing may traumatize and lead to stricture of the common canaliculus, and thus vitiate the result of dacryocystostomy. The intranasal operation is the only procedure feasible in phlegmonous dacryocystitis and in the presence of a severe deformity of the nose. The intranasal operation is preferable in patients requiring intranasal surgery for the correction of intranasal deformity, in fistulating dacryocystitis, and in recurrent dacryocystitis following an external operation. The importance of postoperative follow-up and treatment is stressed. (1 table)

Ray K. Daily.

Fox, Sidney A. **Primary congenital entropion.** A.M.A. Arch. Ophth. **56**:839-842, Dec., 1956.

This uncommon congenital anomaly is probably the result of hypertrophy of the marginal fibers of the orbicularis or less frequently absence or deficiency of the tarsal plate. The anomaly is readily corrected by simple entropion surgery. (2 figures, 17 references) G. S. Tyner.

Holland, R. W. B. **Summerskill's dacryocystorhinostomy.** Brit. J. Ophth. **41**: 111-114, Feb., 1957.

Summerskill's operation, which is a method of dacryocystorhinostomy by means of a polythene tube, represents a definite advance over other methods. It is recommended for all types of obstruction of the nasolacrimal duct, it has the advantages of speed, simplicity, effectiveness, and absence of postoperative discomfort. In cases of simple obstruction and of fistula, with or without overlying inflammation, treatment by this method was uniformly successful; 36 cases of lacrimal obstruction are presented. (2 references) Lawrence L. Garner.

Singer, M. **Some basic causes for failure in grafting skin and mucous membrane to the lids and socket.** Tr. Am. Acad. Ophth. **60**:679-687, Sept.-Oct., 1956.

The author states that the general condition of the patient is important. When surgery is elective, all chronic and acute ailments must be adequately treated before grafting. If grafting is an emergency, all supportive measures, such as whole blood, plasma, and morphine, should be used to save the patient's life. It is important to select the proper type of graft for the particular situation in each case, whether full-thickness or split-thickness graft. Improper selection of donor graft may jeopardize the cosmetic affect. It is felt that a full-thickness of palpebral skin from the same or opposite side is the most desirable graft. Before making the skin incision for a graft, the surgeon should study the lines of tension in order to avoid cutting across them. The skin incision should be made at right angles to the skin surface so that the edges may meet perpendicularly when they are sutured. In hair-bearing areas, an oblique incision is necessary to avoid cutting across the hair follicles. Where possible, skin grafts should be handled by sutures passed through the corners or by small skin hooks. Forceps should be fine-toothed. In preparation of the recipient bed, all scar and abnormal tissue must be excised. If injury is extensive and debridement is necessary, it should be extremely conservative. Bleeding within the bed must be controlled by pressure, fibrin soaked in thrombin, coagulating current or a ligature. An adequate pressure dressing is absolutely essential and should not be disturbed for five to seven days and

then removed with extreme care. Dressings, after the first, may be changed at two to five-day intervals. Infection must be diagnosed as soon as possible. Skin homographs for repair of symblepharon have been successful, according to Romanes. Singer states that in symblepharon repair, conjunctiva itself is best and the next best substitute is buccal mucosa. Amnion also has been used. Split skin grafts for conjunctival replacement are used primarily for reconstruction of the socket when the eyeball is absent. (6 figures, 19 references)

Theodore M. Shapira.

Tomashavskaya, A. and Zaikova, M. **Canaliculorhinostomy—a method of effective treatment of traumatic dacryocystitis.** Vestnik oftal. 1:32, Jan.-Feb., 1957.

The technique of the operation is described. The authors operated on 47 patients with traumatic dacryocystitis during the years 1945 to 1956; 41 patients were followed from 6 months to 10 years. In 37 patients the result was excellent. There was epiphora in one, and in three a recurrence of the dacryocystitis.

Olga Sitchevska.

Zavialov, I. **The surgical treatment of "incurable" epiphora in obliteration of the canaliculi and the tear sac.** Vestnik oftal. 1:6-8, Jan.-Feb., 1957.

Arruga's canaliculorhinostomy was unsuccessful in a few patients, because the consequent scarring led to obliteration at the site of junction. The operation was modified by putting several fine threads through the junction of the canaliculi into the nasal meatus. They were left in situ for 14 to 21 days. If remnants of the mucosa of the sac were encountered during the operation, then a dacryocystorhinostomy was performed. A special knife with a double cutting edge was used for the incision of the canaliculi. Of 27 patients operated on, the color tear-nose test was positive in 13 for the period of observation from nine months to four and a half years. In some of the patients in whom this test was negative, rhinostomy was done with a permanent insertion of a cannula. (1 drawing)

Olga Sitchevska.

16
TUMORS

Blatt, N., Ursu, A., Iofciulescu, P., Barcanescu, B. and Popescu, J. **The invasion potential of intraocular tumors and the power of resistance of the lens.** Arch. f. Ophth. 158:360-379, 1957.

The authors start their paper with the statement that intraocular malignant tumors apparently never invade the lens. Their statement is supported by the microscopic study of 14 eyes with malignant tumors; 22 photomicrographs are presented. Some damage to the lenses is noticeable but the authors' statement seems to be correct. No explanation is offered in spite of the fact that related problems were discussed in American literature several years ago (Am. J. Ophth. 31:561, 1948). (22 figures, 6 references)

Ernst Schmerl.

Foster, J., Henderson, W., Cowie, J. W. and Harriman, D. S. F. **Choroidal sarcoma with metastasis in the opposite orbit.** Brit. J. Ophth. 41:42-47, Jan., 1957.

A 56-year-old woman had her right eye enucleated for choroidal melanoma in 1951 with no untoward after-effects until late 1955 when she noted blurred vision and exophthalmos in her remaining eye. Her vision was reduced and she had a hemianopic scotoma on the outer side of the fixation point. The fundus was normal but X-ray studies suggested retrobulbar tumor. A transfrontal surgical removal of the orbit roof revealed a cherry red, walnut-sized tumor displacing the optic nerve laterally. It was incompletely removed.

The vision and the exophthalmos improved considerably.

Histologic studies showed the tumor to be a melanoma identical to the first tumor. Within a year generalized metastasis has occurred. Only one such metastasis has been reported previously. (8 figures, 2 references) Morris Kaplan.

Hager, G. **Differential diagnosis of the keratoakanthoma.** Arch. f. Ophth. **158**: 393-402, 1957.

The keratoakanthoma occurs as a skin tumor which develops to 10 or 15 mm. in diameter within a period of 8 to 12 weeks. Around the eyes it is found in the skin of the lids and lid margins. It forms a volcano-like mass which, when left untreated, usually disappears within three months. Its histologic appearance resembles that of reticuloepithelial cell tumors. Its volcano-like crater contains parakeratotic masses, the base shows hyperplasia, but the epithelial buds never penetrate deeper than near the sweat glands. Regression and degeneration are seen in tumors more than two months old. Therapeutically, excision, cauterization or small X-ray doses are successful. (11 figures, 21 references) Ernst Schmerl.

Kirk, H. Q. and Petty, R. W. **Malignant melanoma of the choroid.** A.M.A. Arch. Ophth. **56**:843-860, Dec., 1956.

The author reviewed 228 enucleated eyes with melanoma of the choroid and correlated the clinical and laboratory findings. Twenty-four were not diagnosed clinically and an additional 81 eyes were enucleated for melanoma but the diagnosis was not substantiated histologically. The cases misdiagnosed as malignant melanoma proved in order of frequency to be, glaucoma with hazy media, intraocular hemorrhage, disciform degeneration, inflammatory disease, serous retinal detachment, cysts of the iris, retina, or cysticercus of the vitreous, benign pigment, and other tumors, such as astrocytoma and metastatic carcinoma.

Clinical diagnoses in undiagnosed melanomas were glaucoma, phthisis bulbi and retinal detachment. (31 figures, 8 tables, 2 references) G. S. Tyner.

Levy, W. J. **Neuroblastoma.** Brit. J. Ophth. **41**:48-53, Jan., 1957.

Neuroblastoma is not particularly rare, but occurrence of the tumor primarily in the orbit is quite rare. A three-year-old child displayed an orbital mass after mild trauma. The mass receded after antibiotic treatment but soon recurred and progressed. Biopsy revealed neuroblastoma. Despite intensive high-voltage therapy, the child died. Autopsy revealed generalized metastasis from what was most likely a primary tumor in a retrobulbar ganglion. (4 figures, 3 references) Morris Kaplan.

Osorio, L. A. **A case of peripheral glioma of the orbit (neurilemmoma).** Arq. brasil. de oftal. **19**:127-135, 1956.

A 12-year-old girl had a progressive, painless proptosis of the right eye for about three years. Visual acuity of the eye was reduced, and a mild degree of papilledema was present. A tumor mass was palpable in the superior lateral portion of the orbit. Excision was done through a Kroenlein incision; the pathologic diagnosis was neurilemmoma.

Neurilemmoma, also known as peripheral glioma, arises from cells of the sheath of Schwann. It may occur as an isolated tumor in the orbit, as in this patient, in the eyeball or in other regions. Any orbital nerve may be the site of origin, with the sole exception of the optic nerve which has no neurilemmoma. Absence of pain is considered a diagnostic feature, as is the absence of positive radiographic change. The optic nerve may be compressed by the tumor mass, but is never invaded. Clinically, slowly progressive exophthal-

mos, limitation of ocular motility, and signs of pressure on the globe and optic nerve, which may lead to complete blindness, are manifest. Trophic ulceration of the cornea may occur. The tumor is benign, does not recur, and is not responsive to radiation therapy. Some authors consider it phakoma or forme fruste of neuroectodermosis. The tumor is encapsulated and highly vascularized, composed of elongated, cylindrical cells which tend toward palisade formation. When there is intraocular growth, infantile glaucoma or angiomatosis may be observed as a related disorder. This tumor has not received its proper recognition in the general literature, and has not been diagnosed in many instances because of its polymorphism. (2 figures, 7 references)

James W. Brennan.

18

SYSTEMIC DISEASE AND PARASITES

Adams, D. D. and Purves, H. D. **Role of thyrotrophin in hyperthyroidism and exophthalmos.** Metabolism 6:26-35, Jan., 1957.

This is a review of modern thought on the role of thyrotrophin (TSH). It is felt that the normal type of thyrotrophin which is secreted by the normal pituitary in response to low blood thyroid hormone levels is not the agent responsible for the production of exophthalmos; but rather an abnormal or impure form of thyrotrophin is the responsible agent. This abnormal substance may also be the cause of hyperthyroidism, as it can be demonstrated by sensitive assay methods in both conditions. (35 references)

Harry Horwich.

Lamberg, B. A. **The thyro-hypophysial syndrome: roentgen irradiation of the pituitary region in the treatment of the hypophysial eye signs (including exophthalmos) after thyroidectomy.** Acta Med. Scandinav. 156:361-376, 1956.

This term (THS) is used to describe the ocular signs of Graves' hyperophthalmopathic disease. From his own work, and the literature, the author has deduced that there is a generalized connective tissue syndrome affecting especially the retrobulbar tissues, related in some loose way to thyroid function, and under the initial control of the pituitary. The most efficient form of therapy for this syndrome appears to be irradiation of the pituitary region.

This is a four-year report on pituitary radiation in one man and 22 women. Results were classified according to immediate response (wherein 22 out of 23 were favorable) and late response (wherein 17 out of 22 were good, 3 were unchanged, and 2 had progressed).

Apparently early irradiation of the pituitary is advisable since no improvement occurred in cases with long-standing fibrosis. (120 references)

Harry Horwich.

Lamberg, B. A. **The thyro-hypophysial syndrome: hypophysial eye signs (including exophthalmos) without thyrotoxicosis (solitary thyro-hypophysial syndrome) and their treatment by roentgen irradiation of the pituitary region.** Acta Med. Scandinav. 156:391-402, 1957.

Thirteen patients with thyrotoxicosis and marked eye signs received pituitary irradiation while being treated with thyrostatic drugs. In most cases there was a favorable immediate reaction, and in 11 there was a favorable late reaction. It appeared that the radiotherapy prevented the aggravation of the eye snydrome usually resulting from thyrostatic therapy. (14 figures, 1 table, 34 references)

Harry Horwich.

Rundle, F. F. **Management of exophthalmos and related ocular changes in Graves' disease.** Metabolism 6:36-48, Jan., 1957.

The internist in charge of a patient with thyrotoxicosis should supervise the treatment of exophthalmos. Measurements of exophthalmos and of horizontal ductions should be repeated monthly. The Hertel exophthalmometer was modified by an adjustable forehead rest. Ductions were measured in degrees on a modified perimeter. Exophthalmos cannot appear overnight, but lid lag can. Lid lag is a more conspicuous abnormality than exophthalmos. The eyes should also be examined for papilledema, orbital resistance, fullness of lids, appearance of conjunctiva and cornea, and ease of closure of lids.

Thyrotoxic exophthalmos is a self-limited disease. If vision can be maintained until remission, no further damage occurs. Treatment during the active stages should include 0.5 percent methylcellulose drops, cosmetic dark glasses, cosmetic improvement by posture—holding chin high, early lateral tarsorrhaphy, and decompression of the orbit if necessary. Late treatments during the residual stage would include corneal grafts for ulcer, squint surgery, and prisms. (4 figures, 2 tables, 36 references)

Paul W. Miles.

Unger, Hanns-Helmuth. **Ophthalmoneurologic symptoms with pheochromocytomas.** Klin. Monatsbl. f. Augenh. **130**: 176-189, 1957.

Four patients are discussed. In two of them the hypertensive retinopathy disappeared after a successful removal of the tumors. One patient had also a homonymous hemianopsia. In the third patient the pheochromocytoma was combined with a neurofibromatosis, but she also had a severe hypertensive retinopathy. The fourth patient died with a hypertensive retinopathy grade IV. The EEG was abnormal in all four cases. (12 figures, 46 references)

Frederick C. Blodi.

19

CONGENITAL DEFORMITIES, HEREDITY

Alajmo, A., Pascal, A. and Serra, C. **Congenital encephalo-ophthalmic displasia.** Gior. ital. oftal. **9**:359-388, May-June, 1956.

A case of unilateral anophthalmos and microphthalmos of the opposite side is described. There was a familial history of ocular malformation in ascendant and collateral relatives and one sister had bilateral anophthalmos. Encephalographic tracings of the patient and her four sisters were abnormal. The association of this syndrome with congenital anophthalmia is discussed. (8 figures, 67 references)

V. Tabone.

Gregerson, Eilif. **Ocular abnormalities in progeria.** Acta Ophth. **34**:347-354, 1956.

The authors had an opportunity to follow three cases of progeria with ocular complications for 20 to 25 years. Two patients had microphthalmos, microcornea, and arcuate cornea. One patient had a congenital cataract which was not hereditary. All three patients had scanty eyebrows and lashes and convergent strabismus. One patient had nystagmus and somewhat protruding eyes. Two patients developed ocular disturbances at the age of 15 to 20 years; one patient developed a pale optic papilla and small retinal pigmentation. The second patient developed membranous cataracts and whitish wart-like excrescences at the edge of the pupils which presumably originated in the epithelium of the lens. The literature is reviewed. (6 figures, 28 references)

Ray K. Daily.

Mahneke, Axel. **Epibulbar dermoids and preauricular appendices combined with unilateral malformation of the face.** Acta Ophth. **34**:412-420, 1956.

The literature on the classification of congenital malformations of the skull is

reviewed, and two cases of unilateral malformation of the face combined with epibulbar dermoids and preauricular appendices are reported. The simultaneous occurrence of these malformations is explained by the fact that from the fourth to the sixth embryonic week the sites of these lesions are found in close proximity to each other on the side of the embryo's head and neck. (10 illustrations; 32 references) Ray K. Daily.

Unger, Lothar. **The so-called mesodermal dysgenesis of cornea and iris (Rieger).** Ophthalmologica **132**:27-35, July, 1956.

The principal features of the congenital anomaly described by Rieger in 1935 are indistinctness of the limbus, underdevelopment of the iris stroma, abnormal position and shape of the pupil and anodontia vera. This anomaly Unger has observed in a 43-year-old woman and in her 17-year-old daughter. The very conspicuous anomaly of the irides was complicated in all four eyes by a chronic glaucoma which at the time of the report still responded to miotics. The author raises the point that the anomaly is not really confined to mesodermal tissues. (5 figures, 10 references) Peter C. Kronfeld.

Weekers, R., Moureau, P., Hacourt, J. and André, A. **A contribution to the etiology of the syndrome of ocular retraction (syndrome of Stilling-Turck-Duane).** Acta Ophth. **34**:343-346, 1956.

The authors report a case of this syndrome in one of identical twins. This syndrome, usually considered hereditary, is in this case probably due to an intrauterine inflammatory process. The mother had albuminuria and eclampsia. (4 figures, 6 references) Ray K. Daily.

20

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Forsius, H. and Nikupaavo, A. **Medical dissertations in the field of ophthalmology published in Finland.** Acta Ophth. **34**: 377-390, 1956.

The development of the medical requirements for an ophthalmologic thesis are described and 25 theses published between 1647 and 1917 are briefly abstracted. (2 figures, 63 references) Ray K. Daily.

Vikitzkaya, G. and Pilman, N. **Blindness of school-age children, its causes and prophylaxis.** Vestnik oftal. 1:35-36, Jan.-Feb., 1957.

In children in schools for the blind the cause of blindness was scrophulous disease in 24.5 percent, trauma in 25.6 percent, congenital anomalies in 22.1 percent, disease of the central nervous system in 11.5 percent, lues, myopia and scarlet fever in 1.6 percent, and unknown in 14.7 percent. The loss of vision occurred during the first year of life in 41.9 percent, during the second and third years in 19.3 percent and from the fourth to the eleventh year in the others. Improvement of nutrition and hygienic conditions could prevent much blindness from scrophulous diseases of the eye. Olga Sitchevska.

NEWS ITEMS

EDITED BY DONALD J. LYLE, M.D.
411 Oak Street, Cincinnati 19, Ohio

News items should reach the editor by the 10th of the month. For adequate publicity, notice of postgraduate courses and meetings should be received three months in advance.

DEATHS

Dr. Charles Gregory Barer, Bronxville, New York, died February 8, 1957, aged 52 years.

Dr. Thomas John Goodfellow, Saratoga Springs, New York, died January 19, 1957, aged 72 years.

ANNOUNCEMENTS

ORTHOPTIC EXAMINATIONS

The annual examination of orthoptic technicians by the American Orthoptic Council will be conducted in August and October, 1957.

The written examination will be nonassembled and will take place on Thursday, August 22nd, in certain assigned cities, and will be proctored by designated ophthalmologists.

The oral and practical examinations will be on Saturday, October 12th, in Chicago, just preceding the meeting of the American Academy of Ophthalmology and Otolaryngology.

Application for examination will be received by the office of the Chairman of Examinations, Dr. Frank D. Costenbader, 1605 22nd Street, N.W., Washington, D.C., and must be accompanied by the examination fee of $30.00. Applications will not be accepted after July 1, 1957.

OPHTHALMOLOGISTS WANTED FOR SOUTH SEAS CLINIC

The governor of American Samoa has invited Dr. William John Holmes to conduct an eye clinic at Papeete this year. The clinic is planned for approximately three weeks during the latter part of November or the first week of December. There will be a great deal of eye and lid surgery. Dr. Holmes would like to enlist the help of one or two Board-certified ophthalmologists for this job. The cost of round trip from San Francisco to Samoa is $1,035.00 first class, $799.00 tourist. This expense will have to be borne by the ophthalmologist. However, it is tax deductible. Board and lodging will be furnished by the Samoan government.

Anyone interested in availing himself of this opportunity in a South Seas Island for a three-week period should contact:

Dr. William John Holmes,
1013 Bishop Street,
Honolulu 13, Hawaii.

SOCIETIES

OPHTHALMIC PATHOLOGY CLUB

A total of 39 cases was presented at the meeting of the Ophthalmic Pathology Club, Washington, D.C., April 2nd and 3rd. Dr. Benjamin Rones, Washington, presided at the first session when the following cases were presented:

"Bilateral metastatic tumor of the choroid," F. Phinizy Calhoun, Jr.; "A case of multiple cysts of the iris and ciliary body simulating a malignant melanoma," Torrence A. Makley; "Congenital iris cyst," Windsor S. Davies; "Two cases of malignant melanoma with serous separation of the pigment epithelium," A. Ray Irvine, Jr.; "Malignant melanoma after diathermy treatment," John M. McLean; "Malignant melanoma of the choroid," Joseph M. Dixon; "Limbal epithelioma invading the cornea and the anterior chamber," Frederick C. Blodi; and "An interesting globe," John S. McGavic.

At the second session, Merrill J. Reeh, Portland, Oregon, presiding, these papers were read: "Kayser-Fleischer ring (Wilson's disease)," Edith Parkhill; "Keratoconus," Bertha A. Klien; "Tear gas burn of the cornea," L. Christensen; "Corneal ulcer with secondary orbital carinoma," T. E. Sanders; "Fungus infection, intraocular, following cataract extraction," Helenor Forester; "A case of unusual extension of epithelial downgrowth subsequent to cataract extraction," A. Ray Irvine, Jr. (for S. Rodman Irvine); "Congenital anomaly mostly in the anterior segment," Parker Heath.

David G. Cogan, Boston, presided over the third session at which were presented: "Dermoid of the orbit," James H. Allen; "Congenital neurogenic rest of orbit (posterior encephalocele)," Algernon B. Reese; "Eosinophilic granuloma of orbit," Bradley R. Straatsma; "Large polypoid granuloma from inner surface of each upper lid: Promptly recurring whenever removed during a period of 35 years," Frederick H. Verhoeff; "Chronic ocular pemphigus," Frank C. Winter; "Granuloma of iris and ciliary body: Endophthalmitis," Georgiana Dvorak-Theobald; "A case of Behcet's disease," Alson E. Braley; "Proliferation of corneal endothelium over iris and ciliary body," Lee Garron.

The final session of the meeting was presided over by Lee Garron, San Francisco. These cases were presented: "Hematogenous? heterochromia," Benjamin Rones; "Nevus of the conjunctiva," A. E. Maumenee; "Cancerous melanosis of conjunctiva and malignant melanoma of conjunctiva," Merrill J. Reeh; "Malignant melanoma of the conjunctiva," Michael J. Hogan; "Tuberous sclerosis," Wilfred E. Fry; "Sturge-Weber syndrome and intraocular tuberculosis," Lorenz E. Zimmerman; "A case of Coats' disease," David G. Cogan; "Atrophy of the globe following scleral resection with plastic ring: Polyethylene tube girdle, retinal detachment, and neuroblastoma, metastatic, of the uvea," John R. Finlay.

Urgent Request

The Uveitis Laboratory, University of California School of Medicine, San Francisco, is interested to obtain freshly enucleated eyes from patients with *all types of uveitis* and other endogenous inflammations. Attempts are being made to isolate etiologic agents from these eyes.

The eyes should *not* be fixed in preservatives or frozen, but placed in a sterile bottle, packaged, and shipped as quickly as possible. Please send specimens air express, special delivery, *collect*. Enclose history and findings and mark the package "Fresh Tissue Specimen—Rush."

A report of isolations of organisms and pathologic findings, including a slide, will be sent to the contributor. Credit will be given in any resulting publications if desired.

• • • •

Telegraph collect if specimen being sent. Send eyes to Samuel Kimura, M.D., Michael J. Hogan, M.D., or Phillips Thygeson, M.D., University of California School of Medicine, San Francisco 22.

NEW ORLEANS ACADEMY OF OPHTHALMOLOGY

The Eighth Annual meeting of the New Orleans Academy of Ophthalmology will be held in New Orleans in the Roosevelt Hotel—February 24-28, 1958, featuring "Symposium on Uveitis." The registration fee of $75.00 includes associate membership in the Academy for the year 1958, as well as all other features of the convention. Hotel reservations should be made early by writing directly to the Executive Secretary, P.O. Box 469, New Orleans, La.

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